

Chapter Four

CHEMISTRY AND FOLK MEDICINE

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INTRODUCTION

The Plant Taxonomy Laboratory of the Plant Genetics and Germplasm Institute in Beltsville, Md., has a matrix devised for screening exotic diversification crops for underdeveloped areas. Repeated in tables here, the matrix contains abbreviations for scientific names of 1,000 crop species.

In this chapter I shall attempt to show how the matrix can be used to suggest correlations or lack of correlations between crop chemistry, mostly nutritional, and folk medicine, mostly Amerindian. In order to do this I will discuss some of the nutritional analyses of crop species, Amerindian ethnomedicinal uses of these same species, and modern medicinal recommendations for nutritional "therapy." Since others in this volume write of teratogens and antitumor

agents, my examples are biased in that direction.

My personal physician (who chooses to remain anonymous) says that many of the people who visit him should not be there, that many have self-healing ailments that would mend without medication, given a little time, and that many are psychological cases who might "heal" as well with a placebo as with a pill. About 10% of the folk medicine plants of Mexico are said to be effective for what the natives use them. My interest in folk medicine began with my ethnobotanical work with the Choco (an endangered "species" of Indians), Cuna Indians, Blacks, and Castillians of Panama and Colombia. I had an ugly tropical ulcer on my ankle, blamed on dumbcane, *Dieffenbachia seguine*, which North American doctors, calling my ailment "cellulitis," and Special Forces doctors, calling it "jungle rot", stated would lead to my losing my foot unless I returned to the United States for treatment.

Then came "Swamp Fox II," a military mobility study in tropical Panama, with which I worked as a consultant on the botany of the Bayano area of Panama. Jungle Blacks said I might heal, if I treated the ulcer periodically with powdered sulfur after washing it with peroxide. Off I went to the jungle, laden with peroxide and sulfur, limping across the Rio Mamoni. After a total of three years in Panama, I still have my foot, thanks to luck, jungle medicine, or both.

After that experience, I more readily listened to native medicine men. I used *Piper darienensis* to treat, effectively, a toothache; I poulticed castor leaves on to sores, and wild fig juice on to cuts, with no obvious harm, with no proof of help either. I recorded the native uses of the flora of Panama and Colombia.¹ The Choco, Cuna and Blacks are rapidly being acculturated; their folk uses of plants may wane before they have all been documented.

More recently I made two trips to Bolivia and became interested in "Callahuaya" Indians. Today in Bolivia, a more prevalent meaning seems to be witch doctor or medicine man, be he Quechua, Aymara, or Castillian.

Drug plants, many if not all originally identified from folk medicinal practices, are important even in the United States. Of a sample of 2.5 million prescriptions written from 1956 through 1960, over 47% contained drugs of natural

origin.² Between 1959 and 1960, use of drugs of natural origin increased 7.7%. Drugs containing plant products represented over 34% of all drugs of natural origin. Krochmal cited 125 medicinal plants of Appalachia for which there was a demand.² Among those nearly 10% are in our crop matrix: *Acorus calamus*, *Chenopodium ambrosioides*, *Fragaria virginiana*, *Gaultheria procumbens*, *Juglans cinerea*, *J. nigra*, *Juniperus communis*, *Lobelia inflata*, *Marrubium vulgare*, *Mentha piperita*, *spicata*, *Nasturtium officinale*, *Nepeta cataria*, *Panax*, *Phytolacca americana*, *Salvia officinalis*, and *Tanacetum vulgare*.

NUTRITIONAL CHEMISTRY

In the crop matrix, 1,000 potential crop species were bibliographically scored from selected Food Composition Tables.^{3,4,5,6} Complete indices to scientific names, authorities and ecological tolerances are being published elsewhere⁷, but Tables 2-16 (which are located in the Appendix at the end of this chapter) show examples of the matrix. For example, Table 2 presents the complete matrix of common names, while, in Table 3, I have underscored abbreviations of those species reported to have a low calorie content (<25/100g edible portion). The other three categories for calories are fair (25-100/100 g), moderate (100-300/100 g), and high (>300/100 g) (Table 4). The four data groups for protein are arbitrarily set at low (<1 g/100 g uncooked) (Table 5), fair (1-3 g/100 g uncooked), moderate (3-10 g/100 g uncooked), and high (>10 g/100 g uncooked) (Table 6). If interested in low protein crops, the reader will note from Table 5 that C-17 (ACO) has been underscored. By referring to Table 2, he finds that C-17 is the pineapple, *Ananas comosus* (L.) Merr.

Similar categories have been established for fat, carbohydrates, fiber, ash, calcium, phosphorus, magnesium, iron, sodium, potassium, vitamin A (Tables 7,8), thiamin, riboflavin, niacin, and vitamin C (Tables 9, 10). This enables a considerable reduction of much of the analytical data given in the four food-analysis books, and enables one rapidly to search for items high or low in a given category.

Someone forced to assume a diet high or low in any of these nutritional elements could consult the appropriate table and find which of the 1,000 species are reported to

have the desired dietary attribute. Further research might still be in order. Some plants, like *Phaseolus vulgaris* (PVU at position c-14), have broad ranges in their chemical analyses, because the ripe seeds (e.g., pinto beans) differ widely from the green pods (e.g., string beans). Fruits may vary by a factor of three in mineral composition, depending on the substrate. Still, if one wished a diet low in calories and calcium, yet high in vitamins A and C, he could consult the appropriate tables and find plants reported to share all these attributes.

In addition to these chemical tables, information on ecological range (life zone), salt pH tolerance, and tolerances to a wide variety of environmental conditions such as salt, drought, waterlogging, frost, heat, poor soil, shade, insect attack, and disease have also been prepared in matrix form for the 1000 species.

FOLK MEDICINE

Many crop species are used as folk medicine by various ethnic groups. In our matrix, we have underscored those of the 1,000 species in the Blackfoot (Table 11), Callahuaya (Table 12), Choco (Table 13), Cuna (Table 14), Kumaon, Samoan, Santal, and Tongan pharmacopoeias, based on the sources cited in the references.¹⁻⁹⁻¹⁰⁻¹¹⁻¹²⁻¹³⁻¹⁴⁻¹⁵⁻¹⁶⁻¹⁷

We have also underscored species abbreviations if they were reported to treat abscesses, arthritic complaints, asthma, bronchitis, cancer, cholera, colds, dysentery, fever, hemorrhage, neuralgia, sores, soroche, stomach, stones, tumors (Table 15), or worms (Table 16).

Choco and Cuna Indians respect ipecac (CIP at position J-14)¹⁻¹¹, and modern medicine respects ipecac. All ethnomedicinal lore should be studied before ethnic groups or the plants they use become genetically swamped, endangered, or extinct. Cuna and Choco Indians use stinging nettles (Urticaceae) to treat arthritic complaints, and rural people in the United States sometimes recommend bee stings for similar complaints. These might seem strange differences, though formic acid is active in both. There are dozens of species of stinging nettles, but only one, *Urtica dioica* (UDI at position m-5), is considered in the crop matrix. Although it is sometimes consumed as a potherb, no analytical data

are available to me. It has been reported as a folk cure for arthritic complaints and for colds, and it is listed among the cancer actives in the cancer-screening program at Beltsville. It appears in the Callahuaya pharmacopoeia as an antitumor agent, but this stinging nettle is not reported in the Tropical Moist Forest Life Zone occupied by the Choco and Cuna Indians. Its place is taken, ecologically and pharmacologically, by a humid tropical *Ureara* species.

About 15% of the species in our crop matrix are primarily drug plants. There is no fine line between drug plants, folk medicine plants, medicinal resins, and plants that have other uses equally as important as their drug uses, such as the masticatory coca, from which cocaine is derived, the fiber hemp, from which tetrahydrocannabinol is derived, and the poppyseed poppy, from which opium can be obtained. Many of the essential oils, fumitories, resins, spices, and latices are also used as drugs.

Probably all plants have been used medicinally, at one time or another. To tribes like the Cuna, all plants and animals have medicinal uses. One may also find pages from the Bible, bits of broken glass, tin cans, etc., in their medicine kit. Although I have reported plants for which they gave me specific uses, many curanderos said they used all plants.

Species diversity increases toward the tropics. Only 5 Blackfoot Indian plants occurred in our matrix of 1,000 crop species, in contrast to more than 60 Choco Indian medicinal plants. More than 100 Cuna plants for which I obtained specific uses are listed. The Callahuaya have closer to 200 (some of which occur in Bolivia) or 20% of the crops of the world in their pharmacopoeia (Table 12). Street vendors in La Paz sell everything from llama fetuses to lima beans for medicines.

The Callahuaya are a subtribe of the Aymara who live in the Munecas and Caupolican districts of La Paz. They speak fluent Aymara but consider themselves ethnically distinct. Their primary tongue, since the days of the Inca, is Quechua. They are the famous traveling herb doctors of the Andes, most of the males traveling far and wide with herbal remedies and amulets.

Cardenas discusses the Callahuaya.⁹ The first thera-

peutic plant mentioned in his medicinal plant chapter is coca, *Erythroxylum coca*, which is found in tombs of the Inca, Indians skilled with trepanation. Coincidentally ECO at position Q-17 is underscored in Tables 12, 15 and 16, meaning that coca is one of the few species in the Callahuaya pharmacopoeia which is reported to be an anti-tumor agent, and a vermifuge.

Cardenas says that another fountain of knowledge, in addition to that passed down from the extinct societies like the Inca, derived from Indians of Tahuantinsuyu, whose pharmacopoeia has been expanded and advanced to the present herb doctors of the vicinity of Charazani known as Callahuayas. Until recently these inhabitants of Kanlaya and Chajaya came to La Paz with their knapsacks on their backs, containing their precious drugs. However, Cardenas' appraisal of the Farmacopea Callahuaya is not high.¹⁴ On the other hand, many crops, used with good phytochemical reason, occur in the recent Farmacopea Callahuaya.¹⁴

Callahuaya medicinal plants in our crop matrix include basil, castor, chamomile, coca, ephedra, fenugreek, garlic, hemp, ipecac, mandrake, poppy, quinine, wormseed, etc. Without speculating as to whether the Callahuaya gave some of these to the world pharmacopoeia, or vice versa, it is worth noting that most of these are now grown in Bolivia for medicinal purposes. Coca and quinine, at least, have been used since Inca times. Modern medicine still uses cocaine and quinine. Although there is a trend away from cocaine, natural quinine is indicated for certain types of malaria.

DISCUSSION

Calorie-rich plant foods in our crop matrix include such things as almonds, macadams, pecans, and walnuts, all >600 calories/100 g. Hemp seeds have 421 calories, and betel nuts have nearly 400 calories. Among low-calorie foods are bottle gourds, ceylon spinach, chayote, chinese cabbage, chrysanthemum, colza, cucumber, lettuce, snake gourd, spinach, towel gourd, turnip, udo, water cress, and waxgourd, etc. Among the low-calorie plants, red pepper, onion, and lemon, are also entered in our matrix for folk cancer cures. Horsetail probably does not occur in lowland

Panama, but the other three are components of sauces in the otherwise bland diets of the Cuna and Choco Indians. Three of the high-calorie foods enter the matrix as folk "remedies" for cancer: turmeric, fenugreek, and quinoa; none known to the Cuna and Choco, two however in the Callahuaya pharmacopoeia of Poblete.¹⁴ Low-calorie intake is indicated for arteriosclerosis (if overweight), diabetes mellitus, gout, obesity, and for cardiovascular, gall bladder, and renal diseases; high-calorie intake for malnutrition, fever, and early stages of cystic fibrosis.

Commenting on nutritional management of the anemic geriatric patient, Jukes and Borsook state that providing needed vitamins and iron from food sources alone would require a diet too high in calories, too expensive, and too monotonous.¹⁸ Using the matrix, however, I found that only watermelons and squashes showed through as high iron, low calorie, but this was a "false drop." Their seeds are high iron, high calorie, but the fruit pulp is low in calories and iron.

Protein-rich crops (>25 g protein/100 g, e.g., broad-beans, cucurbit seeds, goabean, hemp seed, horsegram, and, of course, soybean) are more and more in demand today. Ripe seeds of legumes are rich in protein; tender green beans in several genera, even the goabean, contain less protein than the leaves. Tops of cassava, radish, sweet potato, taro, and turnip, contain proportionately more protein than the roots. Non-leguminous leafy vegetables, and watery tropical roots and fruits are low in protein. Cucurbit leaves are often 4-10 times richer in protein than the fruits. Seeds of cucurbits are protein-rich, fruits are protein-poor. Hemp seed has 27% protein, poppyseed 24%, betel nut 6%, and betel leaf 3%. High-protein diets might be indicated for alcoholism, burn patients, kwashiorkor, malnourishment, and marasmus. Low-protein intake might be indicated for hepatic failures due to cirrhosis, hepatitis, and terminal alcoholism. Four syndromes result, in part, from geriatric protein deficiency; hunger edema, pellagra, nutritional liver disease, and nutritional macrocytic anemia.¹⁹ There are five cancer "remedies" among our protein-poor foods, imbu, lemon, peach, pepper, tuna, and three among the protein-rich, fenugreek, opium poppy, and quinoa.

Those wishing to avoid oil in their diet might enjoy

Jerusalem artichoke and lotus seed which have only 1/10 g oil or fat/100 g. The betel nut is 10% oil, the betel leaf less than 1%, hemp seed closer to 25%. Some seeds containing more than 50% oil are the almond, brazilnut, candlenut, filbert, macadam, poppy, sesame, walnut, and watermelon. High oil might be indicated for constipation and malnourishment; low oil intake for arteriosclerosis, early stages of cystic fibrosis, hypercholesterolemia, obesity, pancreatic diseases, and sprue. Low oil is indicated to rest the gall bladder.⁸ Corn, peanut, safflower, and sunflower oils, like whale oil, lower cholesterol levels, while cocoa and palm oils may raise it.

Among low-oil plants in our matrix, burdock, fenugreek, horsetail, lemon, onion, peach, peppers, sodom-apple, tuna, and turmeric are reported as folk cancer "cures," while only the opium poppy finds itself among the high-oil plants in the same matrix.

In this early stage of my compilation there are only the following folk "remedies" for cancer:

A-11 - Sweetflag	J-1 - Jackbean	a-5 - Tuna
B-19 - Onion	J-11 - Periwinkle	b-2 - Poppy
C-1 - Aloe	J-21 - Quinoa	e-14 - Peach
D-12 - Burdock	K-22 - Lemon	f-21 - Rosemary
D-21 - Absinth	M-2 - Ti Palm	h-7 - Jojoba
H-19 - Calendula	M-7 - Turmeric	h-15 - Sodomapple
I-7 - Pepper, green	Q-5 - Horsetail	j-14 - Java Plum
I-10 - Pepper, hot	Y-19 - Balsam apple	I-8 - Fenugreek
I-11 - Locoto	Z-20 - Tobacco	

The following are revealed as folk antitumor agents:

B-19 <i>Allium cepa</i> L.	J-20 <i>Chenopodium ambrosioides</i> L.
C-23 <i>Annona cherimola</i> Mill.	J-21 <i>Chenopodium quinoa</i> Willd.
D-4 <i>Anthemis nobilis</i> L.	L-11 <i>Coffea arabica</i> L.
D-8 <i>Apium graveolens</i> L.	M-3 <i>Coriandrum sativum</i> L.
I-4 <i>Canna edulis</i> Ker	N-10 <i>Cyclanthera pedata</i> (L.) Schrud.

N-11 <i>Cydonia oblonga</i> Mill.	a-13 <i>Oxalis tuberosa</i> Mol.
O-18 <i>Dioscorea bulbifera</i> L.	b-15 <i>Passiflora quadrangularis</i> L.
Q-17 <i>Erythroxylum coca</i> Lam.	c-4 <i>Petroselinum crispum</i> (Mill.) A.W. Hill
R-12 <i>Ficus carica</i> L.	c-14 <i>Phaseolus vulgaris</i> L.
T-14 <i>Hordeum vulgare</i> L.	c-16 <i>Phoenix dactylifera</i> L.
T-18 <i>Hyoscyamus niger</i> L.	d-11 <i>Pisum sativum</i> L.
T-22 <i>Hyssopus officinalis</i> L.	d-25 <i>Portulaca oleracea</i> L.
U-8 <i>Ipomoea batatas</i> (L.) Lam.	e-5 <i>Prunus armeniaca</i> L.
W-6 <i>Linum usitatissimum</i> L.	e-8 <i>Prunus cerasus</i> L.
X-9 <i>Mandragora officinarum</i> L.	f-19 <i>Ricinus communis</i> L.
X-12 <i>Manihot esculenta</i> Crantz	f-21 <i>Rosmarinus officinalis</i> L.
X-17 <i>Marrubium vulgare</i> L.	g-20 <i>Secale cereale</i> L.
Z-7 <i>Musa x paradisiaca</i> L.	h-22 <i>Solanum nigrum</i> L.
Z-20 <i>Nicotiana tabacum</i> L.	l-8 <i>Trigonella foenum-graecum</i> L.
Z-23 <i>Ocimum basilicum</i> L.	m-2 <i>Ullucus tuberosus</i> Caldas
a-5 <i>Opuntia ficus-indica</i> (L.) Mill.	m-5 <i>Urtica dioica</i> L.
a-7 <i>Origanum vulgare</i> L.	m-22 <i>Vicia faba</i> L.

The only antihemorrhagic, antitumor vermifuge I know that is reported to be good for arthritis, asthma, and soroche is the coca plant, which has recently been added to the list of cancer actives. The coca plant has a wider ecological range than might be expected, occurring in Tropical Moist Forest, Tropical Wet Forest, Subtropical Moist Forest, and Warm Temperate Moist Forest Life Zones, the latter close to the ecological habitat of the Callahuaya, the former the home of the Cuna and Choco of Panama.

Of the folk antitumor agents in our crop matrix, cassava, parsley, purslane, and sweet potato are high in vitamin C, while banana, barley, flax, green bean, horsebean, and rye are low. Banana, barley, cassava, cherimoya, flax, green bean, horsebean, oca, and onion are low in vitamin A while apricot, basil, cassava (leaves), celery, coffee, coriander,

green bean, onion, pennyroyal, purslane, sweet potato, and wonderberry are high.

All the Asian matrix cereals are high in carbohydrates (>60 g/100 g)⁶. Many roots and legume seeds fall in the moderate category (30-60 g). Many starchy fruits, roots, green legume fruits and cucurbit seeds fall in the fair category (10-30 g) while cucurbit fruits and leafy vegetables are frequent in the low carbohydrate category (<10 g). In legumes, low carbohydrates often correlate with high protein. Asian analyses of *Canavalia* are higher than readings from other continents. The dried betel nut is 70% carbohydrate, hearts of the betel palm 10%, but the betel leaf is only 1% carbohydrate. Hemp seeds are 28% carbohydrate. High carbohydrate intake might be indicated for early stages of cystic fibrosis, marasmus caused by poor appetite, or underweight. Low carbohydrate intake might be indicated for coeliac disease, diabetes, dyspepsia, hypoglycemia, insulinoma, and obesity.

Because of low fiber content, American foods and the carcinogens associated with them remain in the intestinal tract longer than if we had a high-fiber diet. Many health fadists ingest sunflower seed to add fiber to their diet. However, there is proportionately more fiber in hemp, perilla, safflower, and sesame seed. Like sunflower seeds, cucurbit seeds, high in ash, are not so high in fiber. High fiber might be indicated for several types of diarrhea, as well as prophylactically in diverticulosis and cancer of the lower bowel. Low fiber might be indicated for ulcerative colitis.

Andean Indians may or may not benefit from calcium ingested with their coca. In spite of several inquiries, I have been unable to find a modern food analysis of coca. Instead I referred to Del Granado for analyses of Bolivian coca.¹⁰ I mention this because my program was generated to help provide intelligent alternatives to countries which wish to phase out such narcotic-producing plants as coca and poppy.

There are two main coca-producing regions in Bolivia, Los Yungas and the Chapare. Coca from the drier, cooler, higher Yungas region is preferred by the Indians in La Paz to that from the humid tropical Chapare region; they claim that the Yungas leaves are sweeter. To me, sweet implies

less cocaine (or more sugar). If the Indian chews coca for something other than cocaine, and if neither the beverage industry nor the medical industry has an irreplaceable need for cocaine, is there any legitimate reason for continued cultivation of this plant?

Although Bolivians recently assured me that Yungas coca was higher in cocaine than Chapare coca, reportedly based on three replications, this differs from the data of Del Granado¹⁰:

	Coca from Chapare	Coca from Totora	Coca from Yungas
cocaine	2.40%	1.00%	0.25%
starch	24.50	23.90	36.19
dextrin	5.00	1.20	1.16
sugar	1.40	17.50	11.46
pectic acid	0.80	2.20	1.82
fiber	8.80	7.50	7.80
wood	35.00	29.70	28.57
chlorophyll & oil & wax	3.70	1.00	0.25
ash	5.00	5.00	6.00
water	9.00	0.00	0.00
unknown	4.40	0.00	0.00
	<hr/> 100.00	<hr/> 100.00	<hr/> 100.00

Since there are discrepancies between the old and new reports, since I know of no modern food analysis for coca, and since unwashed coca leaves are often treated with insecticide, new analytical work is in order. Coca has been reported to be rich in vitamins, but I cannot document this as well as I would like. FDA analyses indicated that thiamin ranges from about 0.5-0.75 mg/100 g; riboflavin 0.9-1.2 mg/100 g, and vitamin C 7-23 mg/100 g. The monotonous Indian diet of potatoes, quinoa, barley, oca, etc., might benefit somewhat from coca and ash ingestion.

Vitamin A is often low (< IU/100 g) in colorless cereals, roots, pulses, and unpigmented seeds, fair in some tropical fruits, moderate in green vegetables, and temperate fruits, high (>1000 IU) in red and/or leafy aerial vegetables. Beets, like radish, though red, are devoid of beta-carotene, while beet greens contain ca 3000 IU. Calabash gourd has only 15 IU while the leaves have closer to 15,000, paralleled

by gourds and chayotes. The betel piper leaf has ca 20,000 IU while hemp seed contain only 8. Low vitamin A intake might be indicated in hypervitaminosis A and Xanthosis cutis (carotenemia), high vitamin A for avitaminosis A, cystic fibrosis, and night blindness. Geriatric patients may exhibit Bitot eye spots, hyperkeratosis, night blindness, and xerophthalmia as a result of prolonged vitamin A deficiency. In one survey, 1.5% of Latin American children showed ocular lesions due to hypovitaminosis A.²⁰

To test folk medicines, I independently prepared Table 1 to see what dietary elements were high or low in the folk medicines of the aforementioned ethnic groups. After going through the Food Composition Tables, I found that nearly 60 of the crops had been reported as low-calorie foods, 150 as high-calorie foods, establishing a ratio of expectation of about 1 low calorie to every 2½ high-calorie foods, based on our arbitrary classification. The farthest deviation from the expected ratio for calories was in the folk treatments for hemorrhages where 5 low-calorie items (artichoke, horsetail, lemon, onion, purslane) were used for hemorrhage. All except purslane, *Portulaca oleracea*, are in the Callahuaya pharmacopoeia. I know of no obvious reason why low- or high-calorie intake should affect hemorrhage on the spot, although high-calorie would be indicated to compensate for blood loss.

There was a departure from the norm on high-calorie intake among the folk medicinal remedies for dysentery: baobab, betel, breadfruit, burdock, cacao, chestnut, cinnamon, coconut, corn, cumin, flax, garbanzo, grass pea, Indian almond, Job's tear, lentil, pea, quinoa, rice, sesame, sunflower, and wheat. Ten of these, including rice and corn, are in the Callahuaya pharmacopoeia.

From the protein data of Table 1, we see that high protein departs from the norm in folk cures for dysentery: baobab, breadfruit, cacao, corn, cumin, flax, garbanzo, grass pea, Indian almond, Job's tear, lentil, opium, pea, quinoa, sesame, sunflower, and wheat. High-protein is logically indicated in dysentery.

Low-protein foods, among them annatto, apricot, banana, date, lemon, mango, persimmon, raspberry, and tuna were among the antihemorrhagics, seven of the nine in the Callahuaya pharmacopoeia. Here I think we can see a correlation

Table 1. Relative Incidence of Characters and Coincidence of Paired Characters (Parenthetical numbers indicate the number of the 1000 matrix species reported in a given category).

	TREAT ABSCESS (58)	TREAT ARTRITIS (102)	TREAT ASTHMA (37)	TREAT BRONCHITIS (50)	TREAT CANCER (24)	TREAT CHOLERA (32)	TREAT COLD (101)	TREAT DYSENTERY (84)	TREAT FEVER (117)	TREAT HEMORRHAGE (33)	TREAT NEURALGIA (39)	TREAT SORES (106)	TREAT SOROCHE (9)	TREAT STOMACH (101)	TREAT STONES (47)	TREAT WORMS (85)
LOW CALORIE (58)	4	13	6	8	3	2	14	3	10	5	6	12	1	10	10	7
HIGH CALORIE (143)	13	16	8	8	3	8	14	22	21	4	5	20	2	16	9	16
LOW PROTEIN (122)	12	19	7	9	5	3	22	16	22	9	6	23	0	20	16	14
HIGH PROTEIN (114)	10	13	5	5	2	3	11	11	18	3	6	16	2	15	8	12
LOW OIL (280)	28	40	17	20	12	14	46	38	50	16	11	53	2	41	30	37
HIGH OIL (49)	4	6	3	5	1	0	8	7	11	2	1	10	0	6	2	10
LOW CARBOHYDRATE (164)	17	30	17	17	9	8	32	21	33	9	11	33	2	34	28	32
HIGH CARBOHYDRATE (64)	9	9	4	3	2	1	7	14	9	2	3	8	0	9	6	3
LOW FIBER (48)	5	8	4	6	2	1	10	6	11	2	4	6	1	8	6	12
HIGH FIBER (93)	13	14	6	4	4	3	14	18	16	3	6	17	2	17	5	12
LOW ASH (99)	8	13	2	6	6	1	18	13	16	4	3	12	1	16	12	13
HIGH ASH (152)	20	24	13	12	4	8	19	29	26	7	8	29	1	24	12	22
LOW CALCIUM (185)	18	25	9	9	5	8	28	23	32	7	9	29	2	25	14	26
HIGH CALCIUM (45)	5	5	3	1	0	5	5	8	5	0	4	5	0	7	6	7
LOW PHOSPHORUS (239)	25	36	11	14	8	7	41	27	45	12	10	43	2	35	28	32
HIGH PHOSPHORUS (91)	10	10	2	3	1	2	9	14	14	2	3	13	2	15	6	13
LOW MAGNESIUM (15)	2	1	0	1	0	1	2	0	2	0	0	1	0	2	1	0
HIGH MAGNESIUM (25)	5	4	1	2	1	2	4	2	2	0	3	5	1	5	2	3
LOW IRON (188)	22	28	8	11	7	6	30	28	36	10	9	29	2	29	21	23
HIGH IRON (71)	9	10	5	3	1	5	7	14	12	2	4	17	2	14	11	16
LOW SODIUM (190)	2	29	9	14	8	11	34	31	34	10	10	36	3	35	23	30
HIGH SODIUM (8)	0	2	1	0	0	0	1	2	2	0	1	1	0	1	2	1
LOW POTASSIUM (18)	0	0	0	0	0	0	3	0	2	0	0	3	0	1	2	1
HIGH POTASSIUM (8)	2	0	0	1	0	0	2	1	0	0	0	1	0	2	2	0
LOW VITAMIN A (117)	19	17	6	10	6	6	22	22	29	4	6	23	3	23	7	14
HIGH VITAMIN A (115)	12	21	11	13	4	8	21	15	22	8	10	20	2	24	20	27
LOW THIAMIN (48)	4	4	1	3	4	2	5	4	4	3	1	5	0	4	4	3
HIGH THIAMIN (81)	24	31	12	13	5	9	26	29	32	8	12	35	4	32	18	31
LOW RIBOFLAVIN (59)	6	11	3	6	5	2	13	8	11	3	2	9	1	7	6	7
HIGH RIBOFLAVIN (95)	15	17	9	13	4	10	20	22	21	5	8	23	1	24	19	21
LOW NIACIN (45)	3	8	2	4	3	1	11	9	12	4	1	6	1	6	7	6
HIGH NIACIN (52)	8	8	3	4	1	2	10	9	10	4	3	9	0	11	6	5
LOW VITAMIN C (74)	12	14	5	4	1	7	11	14	15	2	4	14	2	13	9	10
HIGH VITAMIN C (36)	6	6	5	4	2	4	7	6	4	3	2	9	0	6	4	7

between astringency and antihemorrhagic rather than a dietary correlation. Low-protein might be indicated for internal hemorrhage associated with hepatic ailments.

Low-oil was disproportionately high among folk remedies for stones. Since gall stones consist mostly of

cholesterol, this might be a good correlation. High oil was disproportionately high among folk vermifuges. Except for laxative oils, there is no immediately obvious reason for this correlation. High carbohydrate, which might well be indicated for cholera, was disproportionately high in cholera remedies. I see no medical reason, however, why low carbohydrate might be recommended for worms.

High fiber could be indicated to stop the diarrhea associated with cholera, but I see no reason except coincidence for low fiber to be characteristic of bronchitis folk remedies!

Low ash, at least low calcium and low phosphorus, might be indicated in metastatic cancer, where blood levels of calcium are high; and high ash might help replenish electrolytes in cholera patients. On the other hand, I see no reason for low iron for cancer, or low or high phosphorus for soroche. High iron for soroche makes sense. Low magnesium might or might not be indicated for fever, depending on the cause of the fever, while high magnesium, like high zinc oxide, is good for healing sores. High-sodium for asthma makes no sense. High-potassium intake might be indicated for stomach patients whose electrolytic balance was upset. Low-potassium and/or low-sodium might be recommended for ulcers which heal slowly due to edema. Low vitamin A should be contraindicated for abscesses, but high vitamin A and stones seem unrelated.

I know of no reason why low thiamin might be indicated for cancer or high thiamin for asthma, although high thiamin would be indicated for neuralgia. Further I know no reason why low riboflavin might help cancer, but high riboflavin, like most of the B complex, might be indicated for cholera. I know not why low niacin should be good for cancer, but there is good reason for high niacin diets among neuralgics. Low vitamin C, if anything should be contraindicated for fever, while high vitamin C might be indicated for the cachexia associated with some types of cancer.

Scoring a plus for a logical positive correlation, a zero for a correlation with no obvious beneficial or deleterious effects, and a minus for a correlation which is contraindicated, we find that the folk pharmacopoeia, based on nutritional chemistry, is right more often than wrong

and/or neutral.

For the second test of the folk medicines, I sought the help of the Medicinal Plant Resources Laboratory under the leadership of Dr. R. E. Perdue. Of their extensive and rather proprietary list of actives in their cancer screening program, 103 occur in our crop matrix. Dr. Perdue noted an apparent correlation between vermifugal activity and anticancer activity in African plants.

Assuming that all our data were complete and that coincidences of uncorrelated characters were random, one would expect five of our antitumor agents to show activity in the cancer screening program. Superposing the two matrices, we see coincidence at the expected 5 points, suggesting no correlation between our folk antitumor agents and tested cancer actives. Our data corroborate Perdue's vermifuge correlation. On basis of random distribution, we expect nine of our vermifuges to show up among the cancer actives. There are 15. An even higher ratio shows up for our "cancer remedies" and the cancer active file. Based on chance, there should be only three, but, in fact, there are seven, suggesting either that the Callahuaya Indians might have been right with some of their "cancer cures" or that cancer screening has been more intensive among reported folk cures. Of the seven, jute, jojoba, and periwinkle are exotic to the Callahuaya, while the other four folk "cancer cures" that have proven active in the cancer screening program, (calendula, lemon, peach, and senna) are important in the Callahuaya pharmacopoeia.

CONCLUSIONS

The crop matrix shows some potential new correlations between nutritional chemistry and folk medicine. Dietary manipulation of diseases, even in modern medicine, is often so slow that primitive man would not be able to see the cause and effect relationship.

A manual information retrieval can show correlations between some folk remedies and nutritional chemistry, but a computerized system will be necessary to test adequately the significance, if any, of these minor correlations.

Folk medicines must have evolved through trial and

error. Those that were tried and showed immediate benefits survived as the fittest; those that had no effect or negative effects were eliminated. Those with delayed results were more difficult to recognize. The primitive applying an oakgall to a cut is doing the same as modern man applying a styptic after a shaving cut. Results are immediately apparent. When an Indian chews coca leaves, he almost immediately knows that it numbs the mouth, helps a toothache, and curbs the appetite. It takes longer to learn that the bitter principle in quinine can cure malaria. But it would take long and detailed medical research to show that the calcium consumed with coca in Colombia, or with betel in Burma, might prevent or alleviate osteoporosis.

Folk responses to alkaloids like quinine and cocaine may be much more immediate than responses to nutritional chemistry. It might take months for man to realize that he was responding to good diet. But if primitive man could learn the correlation between sexual intercourse and childbirth nine months later, perhaps he could notice physical responses to dietary changes, nine months earlier.

While obviously laden with taxonomic errors, the Callahuaya pharmacopoeia contains about 2000 crops, many of them only recently showing new medicinal promise.

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APPENDIX OF CROP MATRIX TABLES

- Table 2. Common Names of Crops in the 1000 Crop Matrix
- Table 3. Low Calorie Crops ($<25/100$ g)
- Table 4. High Calorie Crops ($>300/100$ g)
- Table 5. Low Protein Crops (<1 g/100 g)
- Table 6. High Protein Crops (>10 g/100 g)
- Table 7. Low Vitamin A Crops (<2 IU/100 g)
- Table 8. High Vitamin A Crops (>1000 IU/100 g)
- Table 9. Low Ascorbic Acid Crops (<2 mg/100 g)
- Table 10. High Ascorbic Acid Crops (>100 mg/100 g)
- Table 11. Crops Occurring in the Blackfoot Pharmacopoeia
- Table 12. Crops Occurring in the Callahuaya Pharmacopoeia
- Table 13. Crops Occurring in the Choco Pharmacopoeia
- Table 14. Crops Occurring in the Cuna Pharmacopoeia
- Table 15. Antitumor Agents
- Table 16. Vermifuges

Table 2. Common Names of

A	OKRA	MISK OKRA	CHINA JUTE	HUISACHE	BLACK WATTLE	BABUL	GOLDEN WATTLE	GUM ARABIC	SHITIM WOOD	SUGAR WAFLE	ACONITE	SWEET FLAG	NILE GRASS
B	CRESTED WHEATGR	TALL WHEATGR	INTERMED WHEATGR	QUACK-GRASS	STREAMB WHEATGR	STEBIAN WHEATGR	WESTERN WHEATGR	BLUEBUNCH WHEATGR	SLENDER WHEATGR	VELVET BENTGRASS	REDTOP	CREeping BENTGRASS	COLOVIAL BENTGRASS
C	BARBADOS ALOE	CAPE ALOE	SCOTCH ALOE	CREeping FOXTAIL	MEADOW FOXTAIL	LESSER GALANGAL	ALYX- CLOVER	INCA CLOVER	SPANISH GREENS	PRINCESS- FEATHER	LIVID AMARANTH	CHINESE AMARANTH	SPANISH CARROT
D	SOURSOP	BULLOCK'S HEART	SUGAR APPLE	ROMAN CHAMOMILE	CHERVIL	KIDNEY VETCH	BIGNAY	CELERY	CELERY	FRANUT	SPIKENARD	BURDOCK	BETEL NUT
E	BREAD-FRUIT	CHEMPEDAK	JACKFRUIT	ARUNDIN-ARIA	GIANT REED	WOOLLY PAPAW	PAPAW	SPRENGER ASPARAGUS	ASPARAGUS	SWEET WOODRUFF	TRAGA-CANTH	SALTBUCH	BUTTER LEAVES
F	KAPUNDUNG	BACCAUREA RAMIFLORA	PEACH PALM	UDJUNG ATUP	DESERT DATE	BAMBUSA	CAMWOOD	UPLAND CRESS	BUCHU	MALABAR SPINACH	CAMEL'S FOOT	SLOUGH-GRASS	WAXGOURD
G	YELLOW BLUESTEM	COMAGUE- YANA	SILVER BLUESTEM	SIDEWAYS GRAMA	BLACK GRAMA	BLUE GRAMA	SIGNAL GRASS	YAGUE	BRACHIA- LA EMINI	PARAGRASS	BROWNTOP MILLET	BIRD RAPE	PAKCHOI
H	QUAKING GRASS	CALIF BROMER	SMOOTH BROMER	MOUNTAIN BROMER	RESCUE GRASS	RAMON	COM TREE	CUDAPAH ALMOND	BUFFALO GRASS	BALSAMO	SHEA BUTTER	DIVI-DIVI	BRAZIL WOOD
I	JACKBEAN	SWORD-BEAN	ORLOVE JACKBEAN	EDIBLE CANNA	MART- JUNA	CAPER	MANGO PEPPER	PIMENT- CHEN	CAPISCON CHINESE	TABASCO	GOATCHILI	PAPAYA	NORTON PAPAYA
J	SENA COFFEE	ALEXANDR SENA	JAPANESE CHESTNUT	AMERICAN CHESTNUT	CHINESE CHESTNUT	CHINQUA- PIN	EUROPEAN CHESTNUT	CASTILLOA RUBBER	CAUCHO RUBBER	KHAT	PERI- WINKLE	KAPOR	BUTTEL- GRASS
K	MYRETHRUM	PERSIAN INSECT FL	GARLAND CHEYRANT	COSTMARY	CROWN DAISY	CAINITO	AFRICAN STARAPPLE	GARBANZO	ENDIVE	CHICORY	QUININE	PADANG CASSIA	CAMPHOR
L	ORANGE	TACHIRANA	BOLOBOLO	CLAPPER POLYANDRA	CLAUSENA DENTATA	WAMPI	BUTTERFLY- PEA	BLUE PEA	SEA GRAPE	COCONUT	COFFEE	BENGAL COFFEE	ROBUSTA COFFEE
M	TUSSA JUTE	TI PALM	CORIANDE	CROWN- VETCH	COROZO	EUROPEAN FILBERT	CHINESE HAZELNUT	BEAKED HAZELNUT	HIMALAYAN HAZELNUT	STEBIAN HAZELNUT	GIANT FILBERT	TIBETAN HAZELNUT	
N	FIGLEAF GOURD	BROOK CROOK	MIXTA SQUASH	CROOKNECK PUMPKIN	VEGETABLE MARROW	CUMIN	TURMERIC	ZEDOARY	GUAR	ARCURICHA	QUINCE	SERE GRASS	MALABAR GRASS
O	ORCHARD GRASS	CROWFOOT GRASS	CARROT	DENDRO- GALANUS	TUBA ROOT	TUBA ROOT	BECCAR- LICE	ANGELTON BLUESTEM	DICHONDR	DITTANY	YELLOW FOXGLOVE	DIGITALIS	
P	BLACK SAPOTE	KAKI	PERSIMMON	CUMARU	ENG TOMKA BEAN	HOKSE GRAM	KETEN- BILLA	ARG PHAS- ANT TREE	WINTER'S BARK	DURIAN	JEJUTONG	SQUIRTLING CUCUMBER	BARNYARD- GRASS
Q	BLUE WILD RYE	RUSSIAN WILD RYE	PAKISTANI EPHEdra	CHINESE EPHEdra	FIELD HORSETAIL	BOER LOVEGRASS	WEeping LOVEGRASS	LEMMANN LOVEGRASS	TEF	SAND LOVEGRASS	CENTPEDE GRASS	AUSTAL DEST LIME	LIQUAT
R	EUROPEAN BEECH	FELJOA	IND WOOD APPLE	TALL FESCUE	IDAHO FESCUE	HARD FESCUE	SHEEP FESCUE	MEADOW FESCUE	RED FESCUE	CHEMING'S FESCUE	HUANG T'ENG	COMMON FIG	RUBBER FIG
S	BANITI	KARIIS	IMBE	MANGO- STEEN	BIRA TAI	GAMBOGE TREE	WINTER- GREEN	HUCKLE- BERRY	DYER'S FESCUE	YELLOW CENTIAN	AVENS	MPERPO	SOYBEAN
T	SINCHOK	JERUSALEM ARTICHOKE	KAMAJ	LIMPO GRASS	RUBBER	PARA- RUBBER	KENAF	ROSELLE	CURLY MESQUITE	GALLETA GRASS	TOBOSA GRASS	BURBLES	TWO-RODED BARLEY
U	NATAL- INDIGO	HAIKY INDIGO	SPICATA INDIGO	COMMON INDIGO	ICE CREAM BEAN	INULA	WATER SPINACH	SWEET POTATO	GHIABATO	JASMINE	CHILE COCO	HEARTNUT	BUTTERNUT
V	DRAGON'S HEAD	GUINEA GUM VINE	KIRK'S GUM VINE	N AFRICAN GUM VINE	GREATER GALANGA	LANGSAT	ROUGH PEA	GRASS PEA	SWEET BAY	BROAD LEF LAVENDER	COYON LAVENDER	FRENCH LAVENDER	HEMNA
W	LOVAGE	OTTICCA OIL	WHITE MEADOWFOAM	BAKER'S MEADOWFOAM	DONIAS'S MEADOWFOAM	FLAX	SPANISH THYME	LITCHI	INDIAN TOBACCO	ANNUAL EYEGRASS	PERENNIAL EYEGRASS	CACAOQUIN- HO TIMBO	URUCA TIMBO
X	MACADAMIA NUT	MARUA	SWEET MARJORAM	POT MARJORAM	BARBADOS CHERRY	SIBERIAN CRABAPPLE	APPLE	MANEY APPLE	HANDAKE	MANGO	MANICABA	CASSAVA	CEARA PEPPER
Y	SNAIL MEDIC	CAJUPUT TREE	BURMESE LAQUER	SPANISH LIME	WHITE MELILOT	INDIAN MELILOT	SWEET- CLOVER	MOLASSES GRASS	SWEET BALM	CORN MINT	SCOTCH SPEARMINT	FEBBER- MINT	
Z	BLACK MULBERRY	RED MULBERRY	CURRY- LEAF TREE	DMAR BANANA	ENSETE	BANANA	ARACA	BRAZILIAN GRAPE TR	NUMEG	TOLU BALSAM	PERU BALSAM	MYRRH	
a	WATER DROPPORT	OLIVE	SAINFOIN	LILY TURF	INDIAN FIG	CHINE PALM	OREGANO	SERRA- DELLA	AFRICAN RICE	RICE	SHILO-GRASS	OCA	
b	SCARLET POPPY	OPUM POPPY	AFRICAN LOCUST BN	CANDLE- TREE	CUAJILOTE	GUAYULE	DALLIS- GRASS	MARIA- GRASS	KODO MILLET	VASEY- GRASS	PASSION FRUIT	WATER- LEMON	SMT GRAN- ADILLA
c	PEREJIL	PERILLA	AVOCADO	PARSLEY	WATER CANARYGR	REED CANARYGR	TRUE CANARYGR	SUNOL- GRASS	HARDING GRASS	TEPARY BEAN	SIRATRO	SCARLET RUNNER BN	UDMA BEAN
d	BAY RUM TREE	ANISE	SILVER PINE	FINTON	BETEL PEPPER	IND LONG PEPPER	KAVA	BLACK PEPPER	JAVANESE LG PEPPER	PISTACHIO	PEA	KAFFIR POTATO	BIC BLUEGR
e	SPEKBOK	EGG-FRUIT TREE	MAMGE SAPOTE	FOUTERIA VIRIDIS	APRICOT	SWEET CHERRY	MYROBALAN PLUM	SOUR CHERRY	COMMON PLUM	DANSON PLUM	ALMOND	CHERRY LAUREL	BEACH PLUM
f	KUDZU	TROPICAL KUDZU	POME- GRANATE	PEAR	SAND PEAR	CORK-OAK	RADISH	RAIMOLFIA	SWEET RESEDA	CANTON RHUBARB	CHINESE RHUBARB	RHUBARB	CHINESE LAQUER
g	PURPLE RASPBERRY	GARDEN RUE	SUGARCANE	CHIA	SAGE	CLARY	EASTERN ELDERBERRY	WESTERN ELDERBERRY	BURNET	SNAKE PLANT	CHINESE TALLON TR	SUMMER SAVORY	WINTER SAVORY
h	DANICA	SESBANIA	ITALIAN MILLET	GOLDEH TIMOTHY	CASSABANA	ACEITUNA	JOJOBA	WHITE MUSTARD	SARSA- PARILLA	CUP-EGG- PLANT	GUINANG	RAM-BEGUN	CILLO
i	SUDAN POTATO	INDIAN- GRASS	ALMUM	SORGHUM	JOHNSON- GRASS	SUDAN- GRASS	SPANISH BROOM	GIRICIRI	PARA CRESS	SPINACH	AMBAKELL	HOG PLUM	RED MUNG BN
j	KOMBE	ARROW POISON	STRYCH- NINE	BARRA- TIMAO	NGERIAN LUCERNE	SIBERIAN LUCERNE	STYRAX	SIAM BENZOIN	COMMON THYME	COMPREV	SWEET BERRY	CLOVE	
k	VOCEL TEPHROSIA	INDIAN ALMOND	ZEALAND SPINACH	ASPARAGUS PEA	KATENFE	BACAO	CACAO	CUPUACH	WILD THYME	COMMON THYME	SALSIFY	HORNED CHESTNUT	
l	WHITE CLOVER	PERSIAN CLOVER	SUB CLOVER	WHITETIP CLOVER	ARROWLEAF CLOVER	SEASIDE CLOVER	HOP CLOVER	FENUREK	LIMBERBERRY	TRITICALE	WHEAT	PERSIAN WHEAT	CLUB WHEAT
m	COLTS- FOOT	ULLUCU	GAMBER	ARABINA	STINGING NETTLE	LOMBUSH BLUEBERRY	RABBITYE BLUEBERRY	CRANBERRY	LIGON- BERRY	CORN SALAD	SPANISH TAMARIND	VANILLA	
n	HAIKY VETCH	MOY BEAN	ABZIKI BEAN	BLACK GRAM	MIN BEAN	RICE BEAN	COW PEA	CATJAN	HARD-LONG BEAN	VIGNA VEXILLATA	FOX GRAPE	MUSCADINE GRAPE	

ALTERNATIVE

Crops in 1000 Crop Matrix

KIWI	BAOBAB	MALABAR NUT	JOINTED COAT GR	NI BAEI	MELEGUETA PEPPER	BABOON SPICE	HENBQUEEN	LECHE-GULLIA	SISAL	FAIRWAY WHEATGR	THICKSPK WHEATGR	A	
TUNG-OIL TREE	CANDLENUT	MU-OIL TREE	CAMEL-THORN	ELEPHANT GARLIC	ONION	FAKKYO	WELSH ONION	GARLIC	CHIVES	CHINESE CHIVES	GIANT TARO	B	
EUROPEAN BEACHGR	AMERICAN BEACHGR	CASHEN	PINEAPPLE	CAMBA GRASS	BIG BLUESTEM	SAND BLUESTEM	DILL	ANGELICA	CHERIMOYA	ILAMA	CIMARRONA	C	
SUGAR PALM	BACURY	HORSE-RADISH	EUROPEAN AFRICA	PERUVIAN CARROT	TALL OATGRASS	SOUTHERN WOOD	ARSINTH	RUSSIAN WORMSEED	TARAGON	MARTINE WORMWOOD	HUCHORT	D	
BELLA-DONNA	ABYSSINICA OAT	RED OAT	WILD OAT	COMMON OAT	STERILE OAT	BRISTLE OAT	SILIMBI	CARAMBOLA	CARPET-GRASS	TROPICAL CARPETGR	RAMBAI	E	
BRAZIL NUT	BEEF	ANANAS	AKKE	RAMIE	RED SILK COTTON	BORAGE	PALMYRA PALM	FRANKINCENSE	CAUCASIAN BLUESTEM	SHEET POTTED GR	AUSTRAL BLUESTEM	F	
BROWN MUSTARD	RAFF	RUTABAGA	BLACK MUSTARD	COLLARDS	BROCCOLI	CABBAGE	BRUSSELS SPROUTS	KOHLRABBI	ASPARAGUS BROCCOLI	CHINESE CABBAGE	TURNIP	G	
SAFRAN WOOD	TARA	PIGON FEED	RATTAN	CORN ROOT	CALENDULA	FRISOL-ILLA	CONSILIP	TEA	RANPION	YLANG-YLANG	JAVA ALMOND	H	
KARANDA	EGYPTIAN NATAL CARISSA	NATAL PALM	SAFFLOWER	CARAWAY	PEGAN	HICKORY NUTS	GUARINUT	FISHTAIL PALM	MEXICAN APPLE	RINCHORN BUSH	AVARAN	I	
ITECAC	CAROB	BUNGU	WAX PALM	TURNIP CHERVIL	LAMB'S QUARTER	WORMSEED	GOOSEFOOT	QUINDA	RHODES-GRASS	FEATHER FINGER GR	AFRICAN OAK	PUSTIC MULBERRY	J
SAIGON CINNAMON	INDIAN BARK	CINNAMON	COLOCINTH	WATER-MELON	LIME	SOUR ORANGE	POMELO	LEMON	CITRON	GRAPE-FRUIT	TANGERINE	K	
CONGO COFFEE	LIBERIAN COFFEE	JOB'S TEARS	ABATA KOLA	GBARJA KOLA	ONE KOLA	COLCHICUM	FRUIT BORAGE	RATALA	DASHEN	COPIABA	WHITE JUZE	L	
CRABBE	SEA KALE	SAFFRON	SLENDERLE CROTALARI	SUNN-HEMP	LANCELEAF CROTALARI	STAR GRASS	AFRICAN BERNARDAG	CHUFA	NUFCRASS	TREE TOMATO	HUON FINE	M	
ROSHA GRASS	NARDUS GRASS	WINTER'S GRASS	CARDON	GLOBE ARTICHOKE	BERMUDA-GRASS	STAR GRASS	AFRICAN BERNARDAG	CHUFA	NUFCRASS	TREE TOMATO	HUON FINE	N	
PANGOLA-GRASS	HUNGRY RICE	BLACK FORTIO	WINCED YAM	AIRPOTATO	COMPOSITA YAM	CONVOLVULACEA YAM	FLOR-INDIA YAM	CHUL-MEKA	CHINESE YAM	EBOE YAM	SERENDIPITY BERRY	O	
BILLON DOLLAR GR	ANTELOPE GRASS	PERENN VELDTR	LINGARO	OIL PALM	WATERNUT	CARDANON	FINGER MILLET	GOOSE-GRASS	CANADA WILD RYE	BASTIN WILD RYE	GIANT WILD RYE	P	
CARIB-GRASS	ROQUETTE	FITWEED	COCA	EUCA-LYPTUS	KADJATQA	SURINAM CHERRY	CANDE-LILLA	LOWKAN	BUCKWHEAT	TATARIAN BUCKWHEAT	AMERICAN BEECH	Q	
VOGEL FIC	TIKIC	GOVERN PLUM	FENNEL	KIMQUAT	GARDEN STRAWBRY	CHILEAN STRAWBRY	EUROPEAN STRAWBRY	VIRGINIA STRAWBRY	FUNTUNIA AFRICANA	FUNTUNIA ELASTICA	MAURITIUS HEMP	R	
COMMON LICORICE	AMERICAN LICORICE	WILD COTTON	TREE COTTON	SEA ISLAND COTTON	LEVANT COTTON	UPLAND COTTON	PHALSA	NIGER SEED	PANQUE	SPANISH SAINFOIN	SUNFLOWER	S	
BARLEY	TSI	HOPS	LUKRAAO	HENRANE	HIFTA GRASS	JARAGUA GRASS	BENEFING	HYSSOP	CANDY-TUT	YERBA MATE	STAR-ANISE	T	
CALIF BLK WALNUT	AMER BLK WALNUT	ENGLISH WALNUT	SEA-RUSH	JUNIPER	KENTJOER	GEOCARPA	SUNNER CYPRESS	LABLAB	LETTUCE	RITTER LETTUCE	CAIABASH	U	
SAPUCAJA NUT	MONKEY POD	LENTIL	GARDEN CRESS	PEPPER GRASS	AUSTRAL SEATREE	SERICEA	KOREAN CLOVER	JAPANESE CLOVER	FENDLER-POD	GORDON-POD	LEAD TREE	V	
BARBASSO	BIRDSFOOT TREFOIL	BIG TREFOIL	NARROW LF TREFOIL	ANGLED LUFFA	SMOOTH LUFFA	WHITE LUPINE	BLUE LUPINE	YELLOW LUPINE	GOM KEE	TOMATO	CURRANT TOMATO	W	
BAIATA	CHICLE	HORE-ROOT	GERMAN CHAMOMILE	BURITI PALM	SPOTTED BURCLOVER	SICKLE MEDIC	BLACK MEDIC	BUTTON CLOVER	CALIF BURCLOVER	ALFALFA		X	
PENNY-ROYAL	APPLEMINT	REARMINT	CHAMPAC	HUEMEGA	BALSAM APPLE	BALSAH PEAR	CERIMAN	WINTER PURSLANE	INDIAN MULBERRY	BENOIL TREE	WHITE MULBERRY	Y	
MYRTLE	WATER CRESS	SACRED LOTUS	CATNIP	RAMBUTAN	PULASAN	TOBACCO	BLACK CURIN	DOCHINEAL	SWEET BASIL	HOARY BASIL	HOLY BASIL	Z	
EROSUS YAMBEAN	TUBEROUS YAMBEAN	GUTTA PERCHA	GINSENG	BLUE PANICOR	KLEIN GRASS	MAIDEN-GANE	GUINEA-GRASS	PROSO MILLET	VINE MESQUITE	TORPEDO-GRASS	SWITCH-GRASS	a	
BANANA FRUIT	BARBAR-DINE	PARSNIP	GUARANA	YOCO	HARMAIA SHRUB	SOGA	PEARL MILLET	KIKUYU-GRASS	ELEPHANT GRASS	QALIA OIL	AUSTRAL SHEEPBUSH	b	
GREEN BEAN	TIMOTHY	DATE PALM	N ZEALAND FLAX	REED GRASS	INDIAN GOOSEBERRY	EMBLIC	PHYLL-STACHYS	TOMATILLA	PERUVIAN CHERRY	POKEWEED	ALLSPICE	c	
ANNUAL BLUEGR	TEXAS BLUEGR	BULBOUS BLUEGR	MUTTON BLUEGR	KENTUCKY BLUEGR	SANDBERG BLUEGR	ROUGHISH BLUEGR	PATCHOULI	TUBEROSE	POLYSCIAS RUMPHIANA	TRIFOL ORANGE	PURLANE	d	
PEACH	JAPANESE PLUM	SIERA	CATTLEY GUAVA	WILD GUAVA	LEMON GUAVA	GUINEA GUAVA	MOUNTAIN GUAVA	GOA BEAN	RED BARNWOOD	SANDERS-WOOD	BARNWOOD	e	
HARY GOOSEBRY	BLACK CURRANT	GARDEN LOTUS	COMMON RED RIBES	EUROPEAN GOOSEBRY	CASTOR BEAN	CHRIST-MAS POPS	ROSEMARY	BLACK-BERRIES	DEMBER-RIES	RED RASPBERRY	BLACK RASPBERRY	f	
QUEBRACHO	RED QUEBRACHO	PEPPER-TREE	LITTLE BLUESTEM	NALAY LAC-TREE	NARUTA NUT	RYE	CHAYOTE	MARCKING NUT	WING-SESAME	SESAME	WILD SESAME	g	
COCONA	SODOM APPLE	TIBBATU	SOLANUM MASHANUM	NATIVE EGGPLANT	EGGPLANT	MELON PEAR	WONDER-BERRY	LULO	PLATE-RUSH	POTATO		h	
IMBU	ALKALI SACATON	SAND DROPSIED	SACATON	CHINESE ARTICHOKE	ST AUGUST GRASS	KAA HE'E	N & T GRASS	ESPARTO	GREEN NEEDLE GR	CREAM FRUIT	UMTSUTI	i	
JAVA PLIN	ROSE APPLE	HALAY APPLE	TAMARIND	TANSY	CHAUJHO-OCRA	KOK-SACHRYZ	DANDELION	OYSTER NUT TREE	ALSIKE CLOVER	CRIMSON CLOVER	RAIL CLOVER	j	
JESUIT NUT	MUZINDA	CLAB GOURD	BESSEEN CLOVER	KURA CLOVER	ROSE CLOVER	POULARD WHEAT	BURMEED	CHIKTI FIBRE	NPUNGA	ANU		k	
EMER	DURUM	PEIKORN	POLISH WHEAT	SPELT	TIMOPHE-ERI	PURPLE VETCH	WOOLLYPOD VETCH	BITTER VETCH	HORSE BEAN	HUNGARIAN VETCH	COMMON VETCH	l	
MA-HA-MA-SOO	KINKAOILI	IRONBEED	NARROWLF VETCH	MONANTHA VETCH	PURPLE VETCH	TEOSINTE	GINGER	WILD RICE	CHINESE JULUBE	JAPANESE LAMNCRASS	MAH GRASS	m	
WINE GRAPE	BANABARA	YAUTIA	OZOTE	CORN								n	

14 15 16 17 18 19 20 21 22 23 24 25

CROP MATRIX

14 15 16
CROP MATRIX

Table 3. Low Calorie Crops (<25/100 g)

.A.	AES	AMO	ATH	ATA	AME	ANI	APY	ASE	ASA	FANA	ACA	ANA	ACH	ADI	AVA	ACY	AMA	ANE	ASC	AFO	ALE	ASI	ACR	ADA	A.	
.B.	ABE	AEI	AIN	ARE	ARI	ASI	ASN	ASP	A'R	ACA	AGI	AST	ATE	ATI	AAR	ABR	AOC	ACO	AGA	AGE	AHA	AGR	AAR	AGH	ADI	AMO.
.C.	ABA	AEE	APE	AAR	APR	AOE	AVA	ACA	ACR	ARY	ALI	ATR	AVE	AVI	AAR	ABR	AOC	ACO	AGA	AGE	AHA	AGR	AAR	AGH	ADI	AMO.
.D.	AMU	ARE	ASQ	APQ	ACE	AVU	ABU	AGR	ARY	ACO	ALA	ACA	API	AES	ARU	AMO	AXA	AEL	AAB	AAB	ACI	ADR	AMA	AVU.		
.E.	ALL	ACH	AIN	ASP	ADO	AGR	ATR	ADE	ADQ	AGU	ACH	AHO	ABE	ABY	ABA	ASA	AST	ABT	ABT	ACA	AAF	ACO	IMO.			
.F.	BAL	BRA	BGA	BFR	BAE	BSP	BNI	BVU	BEE	BAL	BES	BSY	BEX	BVU	BOR	BFA	BNI	BCE	BOF	BFL	BGA	BIN	BIN.			
.G.	BTS	BPE	BSA	BCU	BER	BGR	BRK	BDE	BBM	BRA	BGA	BCH	BJU	BNA	BNI	BOL	BOL	BOL	BOL	BOL	BOL	BPE	BRA.			
.H.	BUU	BGA	BIN	BMA	BUN	BAL	BUT	BLA	BDA	BPA	CGO	CES	CSA	CSP	CRO	CAL	COF	CMU	CPA	CSI	CRA	COB	CIN.			
.I.	CEN	CGL	CEI	CSA	CSP	CAN	CBA	CCH	CFR	CFU	CPA	CPU	CCA	CCR	CTI	CIL	CSP	CAM	CUR	CEI	CAL	CAU.				
.J.	COC	CSE	CCR	CDE	CMO	CFU	CSA	CEL	CUL	CCR	CPE	CIP	CSI	CSE	CAL	CBU	CAL	CAU	CQU	CGI	CVI	CEX	CTI	J.		
.K.	CCI	CCO	CCO	CCA	CSP	CCA	CDE	CAR	CEN	CIN	COF	CBU	CCA	CCA	CAU	CVE	CCO	CIA	CAU	CGR	CLI	CME	CPA	CRE.		
.L.	CSI	C'A	CPI	CFO	CDL	CIA	CIA	CTE	CIV	CNU	CAR	CRE	CCA	CCO	CLI	CLA	CAC	CNI	CVE	CAU	CSP	CTI	CAN	CME	CSA.	
.M.	COT	CTE	CSA	CVA	COL	CAV	CHC	CCO	CCO	CPE	CHE	CMA	CTI	CAB	CMA	CSA	CER	CJU	CIA	CPI	CTR	CES	CRO	CSE	DFR.	
.N.	CFI	CMA	CMU	CPE	CCY	CLO	CZE	CPE	COB	CCI	CFL	CMA	CMI	CMA	CMI	CMA	CSC	CLA	CPI	CTR	CES	CRO	CSE	DFR.		
.O.	DGL	DAE	DEA	DSP	DEL	DMA	DIN	DAN	DAR	DRE	DAL	DGR	DPU	DDE	DDI	DBU	DCO	DFL	DMA	DOP	DRO	DCU	O.			
.P.	DEB	DKA	DVI	DOD	DOP	DUN	DHE	DMA	DWI	DZI	DCO	EEL	ECR	EPY	ECA	EPH	ECO	EDU	ECA	ECO	EIN	ECA	ECI	ECO.		
.Q.	EGL	EJU	EGE	ESI	EAR	ECH	ECU	ELE	ETE	ETR	EOP	EGL	EJA	EPO	EVE	EFO	ESP	FAN	FGH	FVE	FVI	FAF	FEL	FEU.		
.R.	FSY	FSE	LI	FAR	FLD	FLO	FOV	FPR	FPU	FUI	FCA	FEL	FVO	FGI	FIN	FVU	FSP	FAN	FGH	FVE	FVI	FAF	FEL	FEU.		
.S.	GUU	GLA	GLI	GMA	GMU	GTI	GPR	GBA	GTI	GIU	GUR	GJA	GMA	GGL	GLE	CAN	GAR	GBA	GHE	GHI	HSP	HOF	IAM	IPA	IVE.	
.T.	HAN	HTU	HZE	HAL	HBE	HBR	HCA	HSA	HBE	HJA	HMU	HBU	HDI	HVU	HCO	HLU	HAN	HNI	HRI	HSP	HOF	IAM	IPA	IVE.		
.U.	IAH	THI	ISP	ITI	IED	THE	IAQ	TBA	TER	JOE	JCH	JAI	JCI	JHI	JNI	JRE	JMA	JCO	KGA	KGE	KSC	LPU	LSA	LVI	LSI.	
.V.	LIE	LHE	LKI	LOW	LGA	LDO	LHI	LSA	LNO	LLA	LSP	LST	LIN	LMI	LOL	LCU	LSA	LVI	LLA	LCU	LST	LSE	LGO	LIF.		
.W.	LOF	LRI	LAL	LBA	LDO	LUS	LMI	LCH	LIN	LMU	LPE	LNI	LUR	LUT	LOO	LPE	LTE	LAC	LCY	LAI	LAN	LIU	LOH	LES	LPI.	
.X.	MSF	MLO	MRO	MNU	MFO	MBA	MSY	MAM	MOF	MNI	MDI	HES	MGL	MNI	MZA	MAR	MVU	MCH	MVI	MAR	MFA	MLU	MOR	MTO	NSA.	
.Y.	NSC	MCA	MUS	MBI	MAL	MIN	MOF	MSU	MMI	MAR	MGE	MPI	MFO	MRO	MSP	MCH	MNI	MBA	MCH	MDE	MPE	MCI	MOL	NAL.		
.Z.	MNI	MRU	MDE	MKO	MAC	MEN	MFA	MTE	MCA	MFR	MBA	MGE	MOD	NOF	NNU	NCA	NLA	NMU	NTA	NSA	NCO	OBA	OKI	OSA.		
.a.	ORA	OSU	OVI	OJA	OFI	OCO	OVU	OSA	OGL	OSA	OHY	OMI	OTU	PTU	PGU	PSP	PAN	PCO	PHE	PMA	PMI	POB	PRE	PVI.		
.b.	PJO	PZO	PFI	PCE	PEI	PAR	POI	PNO	PSC	PUR	PEI	PLA	PLI	PKO	POU	PSA	PCO	PVO	PHA	PPT	PAM	PCL	PRU	PMA	b.	
.c.	PPE	PPR	PAM	PCR	PAQ	FAR	PCA	PCO	PST	PAC	PAT	PCO	PLU	PVU	PPR	PDA	PTE	PAU	PAC	PEM	PSF	PIX	PFE	PAM	PDI.	
.d.	PAF	PAN	PED	PQU	PBE	PLU	PME	PNI	PRE	PVE	PSA	PES	PAN	PAN	PAN	PAN	PAN	PAN	PAN	PAN	PAN	PAN	PAN	PAN	d.	
.e.	PAF	PCA	PSA	PVI	PAR	PAV	PCE	PCE	PDO	PDU	PLA	PMA	PPE	PSA	PSU	PCA	PRG	PGU	PGU	PNO	PTE	PER	PSA	PSO.		
.f.	PLO	PPH	PCR	PPY	QSU	BSA	RSE	ROD	ROF	RPA	RHH	RVE	RHI	RNI	RRU	RSA	RIV	RCO	ROF	RSP	RSP	RID	RID	RID	f.	
.g.	ROC	RGR	ROF	SGH	SOF	SSC	SCA	SNI	STE	SSE	SHO	SVO	SBA	SIO	SCH	SOL	SOL	SOL	SCE	SED	SAN	SAL	SIN	SRA.	g.	
.h.	SBI	SEX	SIT	SPF	SOD	SGL	SGH	SAL	SAE	SAV	SFE	SGI	SHY	SIN	SIN	SCH	SIA	SMA	SME	SNO	SNI	SQU	STO	STU.	h.	
.i.	SRO	SAV	SAL	SBI	SHA	SSU	SJU	SST	SAC	SOL	SCY	SNO	SPU	STU	SJA	SMA	SSA	SSE	SRE	SCO	STE	SVI	SGR	SHI.	i.	
.j.	SKO	SSA	SNU	SAD	SER	SGU	SHU	SBE	STO	SCO	SPE	SDU	SCA	SJA	SSA	TIN	TVU	TKO	TKO	TOF	TOC	TPE	TCA.	j.		
.k.	TVO	TCA	TTE	TPU	TDA	TBI	TCA	TGR	TSE	TVU	TAM	TPO	TBI	TAN	TCU	TAL	TAM	TFR	THI	THY	TIN	TNI	TNI	TNI	k.	
.l.	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	l.	
.m.	TFA	UTU	UGA	ULO	UDI	VAN	VAS	VCO	VNA	VVI	VLO	VPA	VPL	VCA	VAN	VZI	VAN	VBE	VDA	VER	VFA	VMO	VPA	VSA.	m.	
.n.	VAC	VAN	VMO	VRA	VUM	VUN	VUN	VSE	VIA	VRO	VVI	VSA	YEL	VNA	ZOF	IAQ	ZJU	ZMA	ZJA	ZNA	ZJA	ZJA	ZJA	ZJA	n.	
.1	2	3	4	5	6	7	8	9	10	ALTERNATIVE	CHOP	MINT	17	18	19	20	21	22	23	24	25					

Table 5. Low Protein Crops (<1 g/100 g)

[illegible]

Table 6. High Protein Crops (>10 g/100 g)

A.	AES	AMO	ATH	ATA	AME	ANI	APY	ASE	ASA	ANA	ACA	ACH	ADI	AVA	ACY	AMA	ANE	ASC	ATO	ALE	ASI	ACR	ADA	.A.
B.	ADE	AEL	AIN	ARE	ARI	ASI	ASN	ASP	A'R	ACA	AGI	AST	ATE	ATO	AHO	APS	AM	ACE	ACH	AFI	ASA	ASC	ATU	.B.
C.	ABA	ATE	APE	AAR	APR	AOV	AVA	ACA	ACR	AHY	ALI	ATR	AVE	AAR	AOC	ACO	AGE	AHA	AGR	ACH	ADI	AMO	.C.	
D.	AMU	ARE	ASQ	A'YO	ACE	AVU	ABU	AGR	AHY	ACO	ALA	ACA	APY	AES	ABU	AMO	AXA	AEL	AAB	ACI	ADR	AMA	.D.	
E.	AXA	ACH	AIN	ADQ	AGR	ATR	ADE	AOV	ADU	ACU	AHO	ABE	ABY	ABY	ABY	ABY	ABY	ABY	ABY	ABY	ABY	ABY	.E.	
F.	BAL	BGA	BFR	BAE	BSP	BNI	BVU	BBE	BAL	BES	BSY	BHI	BEX	EVU	BOR	BSA	BNI	BCE	BOF	BEL	BCA	BIN	.F.	
G.	BTS	BPE	BSA	BGU	BER	BGR	BBR	BDE	BBM	BRA	BGA	BCH	BJU	BNA	BNA	BNI	BOL	BOL	BOL	BOL	BOL	BOL	.G.	
H.	BHU	BCA	BIN	BMA	BUN	BAL	BUT	BLA	BDA	BSA	BPA	CCO	CSE	CSA	CSP	CAO	CRO	CAF	COF	CFA	CSI	CRA	.H.	
I.	CEN	CGL	CPL	CEP	CSA	CSP	CAN	CBA	CHP	CPU	CPA	CEP	CGR	CTI	CCA	CIL	CSP	CAM	CUR	CFD	CAU	J.	.I.	
J.	COC	CSE	CGR	CDE	CMO	CPU	CSE	CEL	CUL	CEP	CIP	CST	CSE	CEL	CAU	CAU	CAU	CAU	CAU	CAU	CAU	CAU	.J.	
K.	CLA	COC	CCO	CCA	CSP	CCA	CDE	CAR	CEN	CIN	COF	CBU	CCA	CTA	CVE	CCO	CLA	CAU	CAU	CGR	CLI	CNE	.K.	
L.	CST	C'FA	CPI	CPO	CDP	CLA	CCE	CUE	CNU	CAR	CBE	CCA	CLI	CLA	CAC	CTU	CVE	CAU	CAM	CFA	CES	COF	.L.	
M.	COT	CCE	CSA	CVA	COL	CAV	CGH	CCO	CCE	CHE	CCA	CTI	CAB	CSA	CBR	CTU	CFA	CSP	CTI	CAN	CNE	CSA	.M.	
N.	CFT	CSA	CHI	CMO	CPE	CCY	CLO	CZE	CCE	COB	CCI	CFL	CCA	CNA	CNI	CCA	CSC	CDA	CPL	CTR	CES	CHO	.N.	
O.	DEE	DAE	DCP	DEL	DMA	DIN	DAN	DAR	DRE	DAL	DGR	DPD	DDE	DIX	DIB	DBU	DCO	DOO	DPL	DMA	DOO	DOO	.O.	
P.	DEB	DKA	DVI	DOD	DOF	DUN	DHE	DMA	DNI	DZI	DCO	EEL	ECH	EDU	ECA	EPH	EGU	EDU	ECA	ECO	EIN	ECA	.P.	
Q.	EGL	EJU	EGE	ESI	EAR	ECH	ECU	ELE	ETE	ETR	EOP	EEL	EJA	EPO	EVE	EFO	ESP	EUT	EUN	EAN	ELO	FES	.Q.	
R.	FSY	FSE	ELI	FAR	FID	FLO	FOV	FPR	FPU	FTI	FCA	FEL	FVO	FGL	FIN	FPU	FSP	FAN	FCH	FVE	FVI	FAF	.R.	
S.	GNU	GIA	GLI	GMA	GMU	GTY	GPR	GBA	GTY	GIU	GUR	GJA	GMA	GGL	GLE	GAN	GAR	GBA	GHE	GHI	GAS	GAB	.S.	
T.	HAN	HTU	HZE	HAT	HBE	HBR	HCA	HSA	HBE	HJA	HMU	HBU	HDI	HVU	HCO	HLU	HAN	HNI	HRI	HSP	HOF	IAM	.T.	
U.	IAR	IHI	ISP	ITI	IED	THE	IAQ	IBA	TER	JOE	JCH	JAI	JCI	JHI	JNI	JRE	JMA	JCO	KGA	KGE	KSC	LPU	.U.	
V.	LIT	LHE	LKI	LOW	LGA	LDO	LHI	LSA	LNO	LIA	LSP	LIN	LMI	LOL	LSA	LVI	LLA	LCU	LST	LST	LST	LST	.V.	
W.	LOF	LRI	LAL	LBA	LDO	LUS	LMI	LCH	LIN	LMO	LPE	LNI	LUR	LUT	LOO	LPE	LTE	LAC	LAC	LAL	LAN	LLU	.W.	
X.	MSP	MLO	MNO	MNU	MBA	MSY	MAY	MOF	MIN	MNI	MES	NGL	XBI	MZA	MAR	MCH	MVI	MAR	MCH	MVI	MAR	MFA	.X.	
Y.	JSC	MCA	MUS	MBI	MAL	MIN	MOF	MSU	MOF	MAR	MGE	MPI	MPU	MRO	NSP	MCH	MNI	MBA	MCH	NDE	MPE	MCI	.Y.	
Z.	MNI	MNU	MDE	MRO	MAC	MEN	MFA	MTE	MCA	MFR	NBA	MPE	MOD	MCO	NOF	NNU	NCA	NLA	NMU	NTA	NSA	NCO	.Z.	
a.	OEU	OVI	OJA	OFI	OCO	OVU	OSA	OGL	OSA	OHY	OMI	OTU	PER	PTU	PGU	PSF	PAN	PGU	PAN	PGU	PAN	PMI	.a.	
b.	PBR	PFO	PFI	PCE	PED	PAR	PDI	PNO	PSC	PUR	PED	PLA	PLI	PNO	PQU	PSA	PCO	PVU	PFA	PPT	PAM	PCL	.b.	
c.	PPE	PFR	PAM	PCR	PAQ	PAR	PCA	PCO	PST	PAC	PAT	PCO	PLU	PVU	PPR	PDA	PTE	PAU	PAC	PEM	PSP	PIX	.c.	
d.	PRA	PAN	PED	PPO	PBE	PLO	PME	PNI	PRE	PVE	PSA	PES	PAM	PAN	PAN	PBU	PFE	PFR	PSE	PFR	PTU	PRU	.d.	
e.	PAF	PCA	PSA	PVI	PAR	PAV	PCE	PCE	PDO	PDO	PDU	PLA	PMA	PPE	PSA	PSU	PCA	PR	PGU	PGU	PMT	PER	.e.	
f.	PLO	PHI	PHR	POV	PPY	QSU	RSA	RSE	ROD	ROF	RPA	RHH	RVE	RHI	RNI	RRU	RSU	RSC	ROF	RSP	RSP	RID	.f.	
g.	ROR	RGR	SGH	SGF	SSC	SCA	SNI	STR	SSE	SHO	SHO	SHO	SHO	SHO	SHO	SMO	SSC	SOL	SCA	SED	SAN	SAL	.g.	
h.	SEI	SEX	SIT	SSP	SOD	SGL	SGH	SAL	SAR	SAP	SAV	SFE	SGI	SHY	SIN	SIN	SKH	SIA	SMA	SNE	SNI	SOU	.h.	
i.	SHO	SAV	SAL	SBI	SHA	SSU	SJU	SST	SAC	SOL	SCY	SNO	SPU	STU	SAL	SCM	SWR	SST	SSE	SCO	STE	SVI	.i.	
j.	SKO	SSA	SNU	SAD	SER	SHU	SBE	STO	SCO	SPE	SDU	SCU	SJA	SCA	SIN	TSU	TKO	TOF	TOC	TPE	TCA	.j.		
k.	TFO	T'CA	TTE	TPU	TDA	TBI	TCA	TGE	TSE	TVE	TAM	TPO	TAL	TAM	TFR	THI	THY	THO	THO	THO	THO	THO	.k.	
l.	TRE	TRE	TSU	TVA	TVE	TBI	TSP	TFO	TFR	TAE	TCA	TDI	TDU	TMO	TSP	TTI	TTU	TCO	TRH	THO	THO	THO	.l.	
m.	TPU	UTU	UGA	UDI	UDU	VAN	VAS	VCO	VPA	VUI	VLO	VMA	VPL	VCA	VAN	VZI	VAN	VBE	VDA	VER	VFA	VNO	.m.	
n.	VVI	VAC	VAN	VNU	VRA	VUM	VUN	VUN	VUN	VSE	VIA	VRO	VVI	VSU	NSA	ZNA	ZNA	ZOF	ZAO	ZJU	ZNA	ZNA	.n.	
1	2	3	4	5	6	7	8	9	10	ALTERNATIVE	CHOP	METAL	17	18	19	20	21	22	23	24	25			

Table 7. Low Vitamin A Crops (<2 IU/100 g)

.A. AES	AMO	ATH	ATA	AME	ANI	APY	ASE	ASA	ANA	ACA	ANA	ACH	ADI	AVA	ACY	AMA	AME	ASCI	TAFO	ALE	ASI	ACR	ADA	A.
.B. ADE	AEL	AIN	ARE	ARI	ASI	ASM	ASP	A'R	ACH	AGI	AST	ATE	AVI	AAR	ABR	ACC	ACO	AGE	ACH	AFI	ASA	ASC	ATU	AMA. B.
.C. ABA	AFE	AIN	ARE	ARI	ASI	ASM	ASP	A'R	ACH	AGI	AST	ATE	AVI	AAR	ABR	ACC	ACO	AGE	ACH	AFI	ASA	ASC	ATU	AMA. B.
.D. AMU	ARE	ASQ	A'O	ACE	AVU	ABU	AGR	ARY	ACO	ALA	ACA	API	AES	AMU	AMO	AXA	AEL	AAB	ACT	ADR	AMA	AVU	D.	
.E. AAL	ACH	AIN	ASP	ADO	AGR	ATR	ADU	AGU	ACA	AHO	AHE	AAB	ABY	ABA	ASA	AST	ABI	ACA	AAF	ACO	DMO	F.		
.F. BRA	BRA	BGA	BFR	BAE	BSP	BNI	BDU	BEE	BAL	BES	BSY	BHI	BEF	BOR	BSA	BEN	BOL	BOL	BOL	BOL	BOL	BOL	BIN. F.	
.G. BIS	BPE	BSA	BCU	BER	BGR	BBR	BDE	BEM	BMU	BRA	BCA	BCH	BSA	CNP	CCA	BRI	COF	CMU	CFA	CSI	CKA	COE	BRA. G.	
.H. BHU	BGA	BIN	BMA	BUN	BAL	BUT	BLA	BDA	BSA	EPA	CCO	CES	CSA	CSP	CCA	CRU	CAL	COF	CMU	CFA	CSI	CKA	COE	BRA. G.
.I. CEN	CEL	CPL	CEB	CSA	CSP	CAN	CHA	CHH	CFR	CPU	CPU	CPU	CED	CCR	CTI	CCA	CIL	CSP	CAN	CUR	CEB	CAL	CAU. I.	
.J. CAC	CSE	CCR	CDE	CMO	CPU	CSA	CEL	CUL	CED	CRO	CPE	CCL	CIP	CSE	CAL	CBU	CAL	CAU	CCR	CLI	CNE	CFA	CRE. K.	
.K. CCI	CCO	CCO	CCA	CSP	CCA	CDE	CEN	CIN	COF	CCU	CCA	CCA	CTA	CVE	CCO	CLA	CAU	CAU	CCR	CLI	CNE	CFA	CRE. K.	
.L. CSI	C'FA	CFL	CPO	CDL	CLA	CLE	CUV	CNU	CAR	CBE	CCA	CCO	CLI	CLA	CAC	CNI	CVE	CAU	CAN	CFA	CES	COF	CCA. L.	
.M. COL	CTE	CSA	CVA	COL	CAV	CCB	CCO	CPE	CHE	CCA	CTI	CAB	CNA	CMU	CCA	CSC	CDA	CPL	CTR	CES	CRO	CSE	DFR. N.	
.N. CFI	CMA	CMU	CMO	CPE	CCY	CLO	CZE	CTE	COB	CCI	CTI	CMA	CNA	CMU	CCA	CSC	CDA	CPL	CTR	CES	CRO	CSE	DFR. N.	
.O. DGL	DAE	DCA	DSP	DEL	DMA	DIN	DAN	DRE	DAL	DGR	DFU	DDU	DBU	DCC	DDX	DDT	DAL	DBU	DCO	DDX	DDT	DMA	DOP	DCU. O.
.P. DEB	DKA	DVI	DOD	DOP	DUN	DHE	DMA	DMI	DZI	DCO	EEL	ECR	ECR	EPY	ECA	ECO	ESP	EUT	EUN	EAN	ELO	FES	FTA	FGR. Q.
.Q. EGL	EJU	EGE	ESI	EAR	ECH	ECU	ELE	ETR	EOP	EGL	EIA	EPO	EVE	EFO	ECO	ESP	EUT	EUN	EAN	ELO	FES	FTA	FGR. Q.	
.R. FSY	FSE	LI	FAR	FDI	FLO	FOV	FPR	FPU	FTI	FCA	FEI	FVO	FGL	FIN	FVU	FSP	FAN	FCH	FVE	FVI	FAF	FEL	FRO. R.	
.S. GBU	GLA	GLI	GNA	GMO	GTI	GPR	GBA	GTI	GLU	GUR	GJA	GMA	GGL	GLE	GAN	GAR	GBA	GHE	GHI	GAS	GAB	GTI	HCO	HAN. S.
.T. HAN	HTU	HZE	HAL	HBE	HBR	HCA	HSA	HBE	HJA	HMU	HBU	HDI	HVU	HCO	HLU	HAN	HNI	HHI	HRU	HSP	HOF	HAM	IPA	IVE. T.
.U. IAR	IHI	ISP	ITI	IED	IHE	IAQ	IBA	IER	JOE	JCH	JAI	JCI	JHI	JNI	JRE	JMA	JCO	KGA	KGE	KSC	LPU	LSA	LVI	LST. U.
.V. LIB	LHE	LKI	LOW	LGA	LDO	LHI	LSA	LMO	LIA	LSP	LST	LIN	LMI	LOL	LCU	LSA	LVI	LLA	LCU	LST	LFE	LGO	LIF. V.	
.W. LOF	LRI	LAL	LBA	LDO	LUS	LMI	LCH	LIN	LMU	LPE	LNI	LUR	LUT	LCO	LPE	LTE	LAC	LCY	LAL	LAN	LJU	LCH	LES	LPI. W.
.X. MSP	MLO	MHO	MON	MFU	MBA	MSY	MAN	MOF	MIN	MDI	MES	MGL	MBI	MZA	MAR	MVU	MCH	MVI	MAR	MFA	MLU	MOR	MFO	MSA. X.
.Y. HSC	MCA	MUS	MBI	MAL	MIN	MOF	MSU	MMI	MOF	MAR	MGE	MPI	MFO	MSP	MCH	MNI	MBA	MCH	MDE	MPE	MCI	MOL	NAL. Y.	
.Z. NMI	MRI	MDE	NKO	MAC	MEN	MFA	MTE	MCA	MEF	MBA	MPE	MOD	MCO	NFO	NNU	NCA	NIA	NMU	NIA	NSA	NCO	NBA	OKI	OSA. Z.
.a. OGU	OVI	OJA	OFT	OCO	OVU	OSA	OGL	OSA	OHY	OMI	OTU	PEP	PGU	PSF	PAN	PCO	PHE	PMA	PMI	POB	PRE	PVI	a.	
.b. PBR	PSO	PFI	PCE	PED	PAR	PDI	PNO	PSC	PUR	PED	PIA	PLI	PMO	POU	PSA	PYO	PHA	PTI	PAM	PCL	PPU	PMA	PIN. b.	
.c. PPE	PRR	PAM	PCR	PAQ	PAR	PCA	PCS	PST	PAC	PAT	PCO	PLU	PVU	PPR	PDA	PTE	PAU	PAC	PEM	PSF	PIX	PPE	PAN	PDI. c.
.d. PRA	PAN	PED	PQU	PBE	PLO	PNE	PNI	PRE	PSE	PSA	PES	PAN	PAN	PAN	PBU	PFE	PFU	PSE	PTG	PCA	PTU	PRU	PTK	POL. d.
.e. PAF	PCA	PSA	PVI	PAR	PAV	PCE	PCE	PDO	PDU	PIA	PMA	PPE	PSA	PSU	PCF	PGU	PMO	PTE	PER	PSA	PSO	e.		
.f. PLO	PHR	PCR	PCO	PPY	OSU	BSA	RSE	ROD	ROF	RPA	RHH	RVE	RBI	RRI	RSA	RUV	RCO	ROF	RSP	RSP	RSP	RSP	ROC. f.	
.g. ROC	RGR	ROF	SOH	SOF	SSC	SCA	SNI	STR	SSE	SHO	SNO	SBA	SLO	SSC	SLO	SAC	SCE	SED	SAN	SAL	SIN	SRA. g.		
.h. SBI	SEX	SIT	SSP	SOD	SGL	SGH	SAL	SAR	SAE	SAV	SFE	SHY	SIN	SIN	SIA	SMA	SNE	SNO	SNI	SQU	STO	STU	h.	
.i. SRO	SAV	SAL	SBI	SHA	SSU	SJU	SST	SAC	SOL	SCY	SNO	SFU	STU	SAT	SCR	SWR	SSI	SSE	SCO	STE	SVI	SGR	SHI. i.	
.j. SKO	SSA	SNU	SAD	SER	SGU	SBE	STO	SGO	SPE	SND	SCU	SJA	SMA	SSA	TIN	TVE	TTO	TTC	TPE	TCA. j.				
.k. TVO	TCA	TTE	TPU	TDA	TEI	TCA	TGR	TSE	TUV	TAM	TPO	TBI	TNA	TAF	TAN	TCU	TAL	TFR	THI	THY	TIN	TNI	TPR. k.	
.l. TRE	TRE	TVA	TVE	TWI	TSP	TGR	TTR	XTR	TAE	TCA	TGO	TDI	TDU	TMO	TSP	TTI	TTU	TCO	TEH	TTU. l.				
.m. TPA	TPU	UGA	ULO	UDI	VAN	VAS	VCO	VNA	VVI	VLO	VNA	VZI	VAN	VBE	VDA	VER	VFA	VNO	VFA	VSA. m.				
.n. VVI	VAC	VAN	VNU	VRA	VUM	VUN	VUN	VUN	VVE	VSE	VLA	VRO	VVI	VXSU	ZA	ZOF	ZAO	ZJU	ZNA	ZJA	ZNA	25	n.	
ALTERNATIVE CROP MATRIX																								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25

Table 10. High Ascorbic Acid Crops (>100 mg/100 g)

A. AES	AMO	ATH	ATA	AME	ANI	APY	ASE	ASA	ANA	ACA	AMA	ACH	ADI	AVA	ACV	AMA	ANE	ASC	AFO	ALE	AST	ACR	ADA	A.	
B. ADE	AEL	AIR	ARE	ARI	ASI	ASM	ASP	A'R	ACA	AGI	ATR	ATE	A'FO	AHO	AMO	AFS	ACH	AFI	ASA	ASC	ATU	AMA	B.		
C. ABA	AEE	APE	AAR	APR	AOF	AVA	ACA	ACR	ANY	ALI	ATR	ATE	AAR	AOC	AFS	ACH	AGR	AAR	ACH	ADI	AMO	C.			
D. AMU	ARE	ASQ	AVO	ACE	AVU	ABU	AGR	AGR	ANY	ACO	ALA	ACA	API	ASE	ARU	AMO	AXA	AEL	AAB	ACI	ADR	AMA	AVU		
E. AAL	ACH	AIR	ASP	ADO	AGR	ATR	ADE	AOE	AOJ	ACU	ACH	AHO	AHE	ABY	ABA	ASA	AST	ABI	ACA	AAF	ACO	BSO	E.		
F. BRA	BRA	BFA	BFR	BAE	BSP	BNI	BVI	BES	BSY	BHI	BEX	BVI	BEN	BMD	BRA	BCH	BJU	BNA	BNI	BOL	BOL	BOL	BPE	BRA	
G. BLS	BPE	BSA	BCH	BER	BGR	BDE	BEM	BMD	BRA	BCH	BJU	BNA	BNI	BOL	BOL	BOL	BOL	BOL	BOL	BOL	BOL	BPE	BRA		
H. BRU	BCH	BIN	BMA	BUN	BAL	BUT	BIA	BDA	BDA	BPA	COO	CSA	CSF	CCA	CHD	CFR	CFU	CPA	CPU	CPA	CED	CAL	CAU		
I. CEN	GEL	CFL	CED	CSA	CSF	CAN	CBA	CCH	CFR	CFU	CPA	CPU	CED	CGR	CTI	CCA	CIL	CSP	CAM	CUR	CED	CAL	CAU		
J. CGC	CSE	CDE	CMO	CFU	CSA	CEL	CUL	CEJ	CIP	CSI	CSE	GAL	CAL	CAM	CCU	GGA	CVI	CEX	CTI	CTI	J.				
K. CCI	CCO	CCO	CCO	CSP	CCA	CDE	CEN	CIN	COF	CBU	CCA	CTA	CVE	CO	CLA	CAU	CGR	CLI	CME	CPA	CRE	K.			
L. CSI	C'VA	CPI	CPO	GD	CLA	CTE	CIV	CNU	CAR	CBE	CCA	CCO	CLI	CLA	CAC	CNI	CVE	CAU	CAM	CFA	CSF	COF	CCA		
M. COL	CTE	CSA	CVA	COL	CAY	CCH	CCO	CIO	CFE	CHE	CMA	CTI	CAB	CMA	CSA	CHC	CJU	CLA	CFA	CSP	CTI	CAN	CME	CSA	
N. CFI	CMU	CMO	CPE	CCY	CZE	CPE	COB	CCI	CFL	CMA	CNA	CNI	CCA	CSC	CDA	CPL	CTR	CES	CRO	CSE	DFR	N.			
O. DGL	DAE	DCA	DSP	DEL	DMA	DIN	DAN	DRE	DAL	DGR	DFU	DDE	DEX	DIB	DBU	DCO	DFL	DMA	DOP	DRO	DCU	O.			
P. DEB	DKA	DVI	DOD	DOP	DUN	DNE	DMA	DNI	DZI	DCO	EEL	ECR	EPY	EAL	EDU	ECO	EIN	ECO	EIN	ECO	ECI	ECO	P.		
Q. EGL	EJU	EGE	ESI	EAR	ECH	ECU	ETE	ETR	EOP	EGL	EJA	EGR	EVO	EFO	ESP	EUT	EUN	EAN	ELO	FES	FTA	FRQ	Q.		
R. FSU	FSE	ALI	FAR	FID	FLO	FOW	FPR	FPU	FPU	FTI	FCA	FEL	FVO	FGL	FIN	FVU	FSP	FAN	FCH	FVE	FVI	FAP	FEL	FFU	
S. GRU	GLA	GLI	GMA	GNU	GTI	GPR	GBA	GTI	GLU	GUR	GJA	GMA	GGL	GLE	GAN	GAB	GHE	GHI	GAS	GAB	GTI	HCO	HAN	S.	
T. HAN	HTU	HZE	HAI	HBE	HBR	HCA	HSA	HBE	HJA	HMU	HBU	HDI	HVU	HCO	HJU	HAN	HNI	HRI	HSP	HOF	IAM	IPA	IVE	T.	
U. IAR	THI	TSP	ITI	IED	THE	IAQ	IBA	IER	JOE	JCH	JAI	JCI	JHI	JNI	JRE	JNA	JCO	KGA	KGE	KSC	LPU	LSA	LVI	LSI	U.
V. LTB	LHE	LAI	LOW	LGA	LDO	LHI	LSA	LNO	LLA	LSP	LST	LIN	LMI	LOI	LCU	LSA	LVI	LIA	LGU	LST	LFE	LGO	LIF	V.	
W. LOP	LRI	LAL	LBA	LDO	LUS	LMI	LCH	LIN	LMU	LPE	LNI	LJR	LUT	LCO	LPE	LTE	LAC	LCY	LAI	LAN	LJU	LCH	LES	LPI	W.
X. MSP	MLO	MRO	MON	MU	MBA	MSY	MAM	MOF	MIN	MDI	MES	MCL	XBI	MZA	NAR	MVU	MCH	MVI	MAR	MFA	MJU	MOR	MVO	NSA	X.
Y. ISC	MCA	MUS	MBI	NAL	MIN	MOF	MSU	MOF	MOF	NAR	MGE	MPI	MPU	MRO	MSP	MCH	MNI	MBA	MCH	NDE	NPE	MCI	NOL	MAL	Y.
Z. MNI	MRO	KDE	MKO	MAC	MEN	MFA	MTE	MCA	MFR	MBA	MPE	MOD	MOD	NOU	NCA	NLA	NNU	NTA	NSA	NCO	OKA	OKI	OSA	Z.	
a. OJA	OSU	OVI	OJA	OFI	OCO	OVU	OSA	OGL	OSA	OHY	OMI	OTU	PER	PTU	PSP	PAN	PCO	PHE	PMA	PMI	POB	PRE	PVI	a.	
b. PRR	OSU	PFI	PCF	PED	PAR	PDI	PNO	PSC	PUR	PED	PIA	PLI	PHO	POU	PSA	PCU	PYO	PHA	PPT	PAM	PCL	PPU	PMA	PIN	b.
c. PFE	PFR	PAM	PCR	PAQ	PAR	PCA	PCO	PST	PAC	FAT	PCO	PLU	FVU	PPR	PDA	PTE	PAU	PAC	PEM	PSP	PIX	PPE	PAM	PDI	c.
d. PRA	PAN	PED	PQU	PBE	PLO	PME	PNI	PVE	PFA	PES	PAM	PAN	PAN	PAN	PAN	PAN	PAN	PAN	PAN	PAN	PAN	PAN	PAN	PAN	d.
e. PRA	PAN	PFA	PVA	PFA	PFA	PFA	PFA	PFA	PFA	PFA	PFA	PFA	PFA	PFA	PFA	PFA	PFA	PFA	PFA	PFA	PFA	PFA	PFA	PFA	e.
f. PRA	PPH	PCR	PCO	PPY	QSU	RSA	RSE	ROD	ROF	RFA	RHE	RVE	RNI	RRI	RRA	RSA	RUD	RGO	ROF	RSP	RSP	RID	RCA	f.	
g. ROC	RGR	SOE	SCH	SOF	SSC	SCA	SMI	STR	SSE	SHO	SRA	SLO	SMA	SLO	SMA	SCE	SED	SAN	SAL	SIN	SRA	g.			
h. SBI	SEX	SIT	SSP	SOD	SGL	SCH	SAL	SAR	SAE	SAV	SFE	SGI	SHY	SIN	SKH	SIA	SMA	SME	SMU	SNI	SQU	STO	STU	h.	
i. SRO	SAV	SAL	SBI	SHU	SSU	SJU	SST	SAC	SOL	SCY	SMO	SFU	STU	SJA	SKR	SWR	SST	SSE	SCO	STE	SVL	SGR	SHI	i.	
j. SKO	SSA	SNU	SAD	SER	SBE	STO	SCO	SFE	SDU	SJA	SMA	TIN	TGU	TKO	TOF	TKO	TOF	TKO	TOF	TKO	TPE	TCA	j.		
k. TRO	TRE	TSU	TVA	TVE	TWI	TSP	TFO	TTR	XTR	TAE	TCA	TCO	TDI	TDU	TPO	TSP	TTI	TTU	TCO	TRH	TTU	TRU	k.		
l. TFE	UTU	UCA	ULO	UDI	VAN	VAS	VCO	VMA	VVI	VLO	VPA	VPL	VCA	VAN	VZI	VAN	VAR	VEE	VDA	VER	VPA	VMO	VPA	VSA	m.
m. TFI	VAC	VAN	VND	VRA	VUM	VUN	VUN	VVE	VSE	VLA	VRO	VVI	VSI	VSA	YEL	ZMA	ZNA	ZOF	ZAQ	ZJU	ZNA	ZNA	n.		
n. VVI	VAC	VAN	VND	VRA	VUM	VUN	VUN	VVE	VSE	VLA	VRO	VVI	VSI	VSA	YEL	ZMA	ZNA	ZOF	ZAQ	ZJU	ZNA	ZNA	n.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	

ALTERNATIVE CROP MATRIX

Table 12. Crops Occurring in the Callahuaya Pharmacopoeia

[illegible]

Table 13. Crops Occurring in the Choco Pharmacopoeia

.A.	AES	AMO	ATH	AFA	AME	ANI	APY	ASE	ASA	ANA	ACA	ACH	ADJ	AVA	ACY	AMA	AME	ASC	ATO	ALE	ASI	ACR	ADA	A.		
.B.	ADE	ABL	AIN	ARE	ARI	ASI	ASM	ASP	A'R	ACA	AGI	AST	ATE	AFO	AMO	APS	AM	ACE	ACH	AFI	ASA	ASC	ATU	AMA	B.	
.C.	ABA	ATE	APR	APR	AVO	AVA	ACR	AHY	ALI	ATR	AVI	AAR	ABR	ACC	AGO	AGE	AHA	AGR	AAR	ACH	ADI	AMO	ACH	ADI	AMO	C.
.D.	AMU	ATE	ASQ	A'VO	ACE	AVU	ABU	AGR	AHY	ACO	ALA	ACI	AES	ARU	AMO	AXA	AEL	AAB	ACI	ADR	AMA	AVU	D.			
.E.	AIL	ACH	AIN	ASP	ADO	AGR	ATR	ADE	AOE	AOD	AGU	ACA	AHO	ABE	ABY	ABA	AST	ABI	ACA	AAF	ACO	BRO	E.			
.F.	BRA	BRA	BGA	BFR	BAE	BSP	BNI	BVB	BEE	BAL	BES	BSY	BHT	BEX	BVI	BOR	BSA	BNI	BCE	BOF	BEL	BCA	BIN	BIN	F.	
.G.	BIS	BPE	BSA	BCU	BER	BGR	BBR	BEM	BMO	BRA	BCA	BCJ	BJU	BNA	BNA	BNI	BOL	BOL	BOL	BOL	BOL	BOL	BOL	BPE	BRA	G.
.H.	BHU	BFA	BIN	BMA	BUN	BAL	BUT	BLA	BDA	BSA	BPA	CCO	CSE	CSA	CSA	CCO	CAF	COF	CMU	CFA	CSI	GRN	COD	CIN	H.	
.I.	CEN	CGL	CPL	CEB	CSA	CSP	CAN	CEA	CEH	CEH	CEH	CEH	CEH	CEH	CEH	CEH	CEH	CEH	CEH	CEH	CEH	CEH	CEH	CEH	I.	
.J.	CAC	CSE	CCR	CDE	CMO	GPU	CSA	CEL	CUL	CEB	CRO	GPE	CCI	CIP	CSE	CEH	CEH	CEH	CEH	CEH	CEH	CEH	CEH	CEH	J.	
.K.	CCI	COO	CCO	CMH	CSP	CCA	CDE	CAR	CEN	CIN	COF	CHU	CCA	CCA	CVE	CCO	CAU	CAU	CAU	CAU	CAU	CAU	CAU	CAU	K.	
.L.	CSI	C'FA	CFI	CFO	CDI	CLA	CIA	CIE	CUV	GNU	CAR	CBE	CCA	CCO	CLT	CLA	CAC	CNI	CVE	CAU	CAM	CFA	CES	COF	CCA	L.
.M.	COL	CE	CSA	CVA	COI	CAV	CCO	CCO	CCO	CCO	CCO	CCO	CCO	CCO	CCO	CCO	CCO	CCO	CCO	CCO	CCO	CCO	CCO	CCO	M.	
.N.	CFI	CMH	CMH	CMH	CMH	CMH	CMH	CMH	CMH	CMH	CMH	CMH	CMH	CMH	CMH	CMH	CMH	CMH	CMH	CMH	CMH	CMH	CMH	CMH	N.	
.O.	DGL	DAE	DCA	DSP	DEL	DMA	DIN	DAN	DAR	DRE	DAL	DGR	DPU	DDE	DEH	DIB	DAL	DBU	DCO	DEH	DMA	DOP	DRQ	DCU	O.	
.P.	DEF	DKA	DVI	DOP	DOP	DHE	DMA	DNI	DZI	DCO	DEL	ECR	ECR	EPY	ECA	EPH	EDU	ECA	ECO	EIN	ECA	ECI	ECO	P.		
.Q.	EGL	EJU	EGE	ESI	EAR	ECU	ELE	ETE	ETR	EPO	EGL	EJA	EPO	EVE	EFO	ECO	ESP	EUT	EUN	EAN	ELO	FES	FIA	FGR	Q.	
.R.	FSE	FLE	FAR	FID	FLO	FOP	FPR	FPU	FTI	FCA	FEL	FVO	FGL	FIN	FVU	FSP	FAN	FCH	FVE	FVI	FAP	FEL	FHO	R.		
.S.	GPU	GLA	GLI	GMA	GMU	GTI	GPR	GBA	GTI	GLU	GUR	GJA	GGL	GLE	GAN	GAR	GHA	GHE	GHI	GAS	GAB	GTI	HCO	HAN	S.	
.T.	HAN	HU	HZE	HAI	HBE	HBR	HCA	HSA	HBE	HJA	HMU	HBU	HDI	HVU	HOO	HUU	HAN	HNI	HRI	HRI	HRI	HRI	HRI	HRI	T.	
.U.	IAR	IHI	ISP	ITI	IED	THE	IAQ	IBA	TER	JOE	ICH	JAI	JCI	JHI	JNI	JRE	JMA	JCO	KGA	KGE	KSC	LPU	LSA	LVI	U.	
.V.	LIE	LKE	LKI	LOW	LGA	LDO	LHI	LSA	LNO	LIA	LSP	IST	LIN	LMI	LOL	LCU	LSA	IVI	LLA	LCU	LST	LFE	LGO	LLE	V.	
.W.	LOF	LRI	LAL	LBA	LDO	LUS	LMI	LCH	LIN	LMU	LPE	LNI	LUR	LUT	LOL	LPE	LTE	LAC	LCY	LAL	LAN	LIU	LCH	LES	W.	
.X.	NSP	MLO	MHO	MON	MPU	MBA	MSY	MAM	MOF	MIN	NDI	MES	MGL	MBI	MZA	MAR	MVU	MCH	MVI	MAR	MFA	MLU	MOR	MFO	X.	
.Y.	ISC	MCA	MUS	MBI	MAL	MIN	MOF	MSU	MMI	MOF	MAR	MGE	MPI	MFO	MSP	MCH	MVI	MBA	MCH	MDE	MPE	MCI	MOL	MAL	Y.	
.Z.	NTU	MRU	KDE	MKO	MAC	MEN	MFA	MTE	MCA	MER	MBA	MPE	MOF	MCO	NOF	NMA	NLA	NMU	NKA	NSA	NCO	OBA	OBI	OSA	Z.	
.a.	OJA	OU	OVI	OJA	OFI	OCO	OVA	OGL	OSA	OHY	ONT	OTU	PER	PTU	PGU	PSP	PAN	PCO	PHE	PMA	PMI	POB	PRE	PVI	a.	
.b.	PBR	PFO	PFI	PCE	PED	PAR	PDI	PNO	PSC	PUR	PED	PIA	PLI	PNO	PSU	PAC	PFO	PAC	PET	PAM	PCL	PPU	PMA	FIN	b.	
.c.	PFR	PFR	PAM	PCR	PAQ	PAR	PCA	PST	PAC	PAT	PCO	PLU	PVR	PDA	PTE	PFA	PAC	PEM	PSF	PIF	PPE	PAM	PDI	c.		
.d.	PRA	PAN	PED	POU	PBE	PLO	PME	PNI	PRE	PVE	PSA	PES	PAN	PBU	PSE	PRR	PSE	PRR	PCA	PTU	PTU	PTU	PTU	d.		
.e.	PAP	PCA	PSA	PVI	PAR	PAV	PCE	PCE	PCE	PCE	PCE	PCE	PCE	PCE	PCE	PCE	PCE	PCE	PCE	PCE	PCE	PCE	PCE	e.		
.f.	PPH	PPH	PPH	PPH	PPH	PPH	PPH	PPH	PPH	PPH	PPH	PPH	PPH	PPH	PPH	PPH	PPH	PPH	PPH	PPH	PPH	PPH	PPH	f.		
.g.	ROR	RGR	ROF	SGH	SOE	SGH	SGH	SGH	SGH	SGH	SGH	SGH	SGH	SGH	SGH	SGH	SGH	SGH	SGH	SGH	SGH	SGH	SGH	g.		
.h.	SEX	SEX	SEX	SEX	SEX	SEX	SEX	SEX	SEX	SEX	SEX	SEX	SEX	SEX	SEX	SEX	SEX	SEX	SEX	SEX	SEX	SEX	SEX	SEX	h.	
.i.	SAV	SAV	SAV	SAV	SAV	SAV	SAV	SAV	SAV	SAV	SAV	SAV	SAV	SAV	SAV	SAV	SAV	SAV	SAV	SAV	SAV	SAV	SAV	i.		
.j.	SSA	SSA	SSA	SSA	SSA	SSA	SSA	SSA	SSA	SSA	SSA	SSA	SSA	SSA	SSA	SSA	SSA	SSA	SSA	SSA	SSA	SSA	SSA	j.		
.k.	TFO	TFO	TFO	TFO	TFO	TFO	TFO	TFO	TFO	TFO	TFO	TFO	TFO	TFO	TFO	TFO	TFO	TFO	TFO	TFO	TFO	TFO	TFO	k.		
.l.	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	TRE	l.		
.m.	TFA	TFA	TFA	TFA	TFA	TFA	TFA	TFA	TFA	TFA	TFA	TFA	TFA	TFA	TFA	TFA	TFA	TFA	TFA	TFA	TFA	TFA	TFA	m.		
.n.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	n.		
.o.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	o.		
.p.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	p.		
.q.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	q.		
.r.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	r.		
.s.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	s.		
.t.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	t.		
.u.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	u.		
.v.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	v.		
.w.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	w.		
.x.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	x.		
.y.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	y.		
.z.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	z.		
.aa.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	aa.		
.ab.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	ab.		
.ac.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	ac.		
.ad.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	ad.		
.ae.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	ae.		
.af.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	af.		
.ag.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	ag.		
.ah.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	ah.		
.ai.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	ai.		
.aj.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	aj.		
.ak.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	ak.		
.al.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	al.		
.am.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	am.		
.an.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	an.		
.ao.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	ao.		
.ap.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	ap.		
.aq.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	aq.		
.ar.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	ar.		
.as.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	as.		
.at.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	at.		
.au.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	au.		
.av.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	av.		
.aw.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	aw.		
.ax.	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	ax.		
.ay.	VAC	VAC	V																							

Table 14. Crops Occurring in the Cuna Pharmacopoeia

A.	AES	AMO	ATH	AFA	AME	ANI	APY	ASE	ASA	ANA	ACA	AMA	ACH	ADI	AVA	ACY	AMA	ANE	ASCI	AFQ	ALE	ASI	ACK	ADA	.A.	
B.	ADE	AEI	AIN	ARE	ARI	ASI	ASM	ASP	A'R	ACA	AGI	ALI	ATR	AVI	AAR	ABR	AOC	ACO	AGA	AGE	AHA	AGR	AAR	ACH	ADI	.B.
C.	ABA	APE	AAR	APR	AOA	AOA	AOA	AOA	AOA	AOA	AOA	AOA	AOA	AOA	AOA	AOA	AOA	AOA	AOA	AOA	AOA	AOA	AOA	AOA	.C.	
D.	AMU	ADE	ASQ	A'AO	ACE	AVU	ABU	AGR	ANY	ACO	ALA	ACA	API	AES	ARU	AMO	AXA	AEL	AAB	AB	AB	AB	AB	AB	.D.	
E.	ALL	ACH	AIN	ASD	ADQ	AGR	ATR	ADQ	AGU	ACA	AHO	ABE	ABE	ABE	ABE	ABE	ABE	ABE	ABE	ABE	ABE	ABE	ABE	ABE	.E.	
F.	BRA	BGA	BFR	BAE	BSP	BNI	BVU	BBE	BAL	BES	BSY	BFI	BCE	BOF	BFL	BGA	BIN	BIN	BIN	BIN	BIN	BIN	BIN	BIN	.F.	
G.	BIS	BPE	BGA	BCU	BER	BGR	BBR	BDE	BBM	BRA	BCA	BCH	BJU	BNA	BNA	BOL	BOL	BOL	BOL	BOL	BOL	BOL	BOL	BOL	.G.	
H.	BHU	BGA	BIN	BMA	BUN	BAL	BUT	BLA	BDA	BBA	CCA	CCA	CCA	CCA	CCA	CCA	CCA	CCA	CCA	CCA	CCA	CCA	CCA	CCA	.H.	
I.	CHN	GLP	CHD	CSA	CSP	CAN	CHA	CCH	CFR	CFU	CFU	CFU	CFU	CFU	CFU	CFU	CFU	CFU	CFU	CFU	CFU	CFU	CFU	CFU	.I.	
J.	CCG	CSE	CCR	CHD	CHD	CHD	CHD	CHD	CHD	CHD	CHD	CHD	CHD	CHD	CHD	CHD	CHD	CHD	CHD	CHD	CHD	CHD	CHD	CHD	.J.	
K.	CCI	CCO	CCO	CCA	CSP	CCA	CEN	CIN	COF	CBU	CCA	CVE	CCO	CLA	CAU	CAU	CAU	CAU	CAU	CAU	CAU	CAU	CAU	CAU	.K.	
L.	CSI	CFA	CFI	CPO	CDL	CLA	CLE	CUV	CHU	CAR	CHC	CCA	CCO	CLI	CLA	CAC	CNI	GVE	CAU	CAM	CFA	CES	COF	CCA	.L.	
M.	COL	CTE	CSA	CVA	COL	CAV	CCO	CCO	CCE	CHC	CCA	CTI	CAB	CCA	CHC	CHC	CHC	CHC	CHC	CHC	CHC	CHC	CHC	CHC	.M.	
N.	CFI	CMA	CMU	CMU	CPE	CCY	CLO	CZE	CCE	COB	CCI	CFL	CCA	CHC	CHC	CHC	CHC	CHC	CHC	CHC	CHC	CHC	CHC	CHC	.N.	
O.	DGL	DAE	DCA	DSP	DEL	DMA	DIN	DAR	DRE	DAL	DGR	DDE	DDI	DAL	DBU	DCO	DCO	DCO	DCO	DCO	DCO	DCO	DCO	DCO	.O.	
P.	DEB	DKA	DVI	DOD	DOP	DUN	DHE	DMA	DZI	DDO	DEL	ECK	EPE	ECA	ECO	ECO	ECO	ECO	ECO	ECO	ECO	ECO	ECO	ECO	.P.	
Q.	EGL	EJU	EKE	ESI	EAR	ECH	ECU	ELE	ETE	ETR	EOP	EGL	EIA	EPO	EVE	EFO	ESP	EUT	EUN	EAN	ELO	FES	FIA	FER	.Q.	
R.	FSY	FSE	LI	FAR	FDI	FLO	FOP	FPR	FPU	FPU	FTI	FCA	FEL	FVO	FGL	FIN	FVU	FSP	FAN	FCH	FVE	FVI	FAF	FEL	.R.	
S.	GHU	GLA	GLI	GMA	GMD	GTI	GPR	GBA	GTI	GLU	GUR	GJA	GMA	GGL	GLE	GAN	GAR	GBA	GHE	GHI	GAS	GAB	GTI	HCO	.S.	
T.	HAN	HTU	HZE	HAI	HBE	HBR	HCA	HSA	HBE	HJA	HMU	HBU	HDI	HVU	HCO	HILU	HAN	HNI	HRI	HSP	HOE	HAM	IPA	IVE	.T.	
U.	IAR	IHI	ISP	ITI	IED	IHE	IAQ	IBR	IER	JCH	JAI	JCI	JHI	JNI	JRE	JMA	JCO	KGA	KGE	KSC	LPU	LSA	LVI	LSI	.U.	
V.	LIE	LHE	LKI	LOW	LGA	LDO	LHI	LSA	LNO	LIA	LSP	LST	LIN	LMI	LOL	LCU	LSA	LVI	LLA	LCU	LST	LST	LFE	LGO	.V.	
W.	LOF	LRI	LAL	LBA	LDO	LUS	LMI	LCH	LIN	LMU	LPE	LNI	LUR	LUT	LOO	LPE	LTE	LAC	LCY	LAI	LAN	LIU	LOH	LES	.W.	
X.	MSP	MLO	MHO	MON	MFI	MBA	MST	MAM	MOF	MIN	MDI	MES	MGL	MBI	MZA	MAR	MVU	MCH	MVI	MAR	MFA	MLU	MOR	MFO	.X.	
Y.	HSC	MCA	MUS	MBI	MAL	MIN	MOF	MSU	MMI	MFO	MRO	MSP	MCH	MMI	MBA	MCH	MDE	NPE	MCI	MOL	NAL	Y.			.Y.	
Z.	MNI	MRI	MDE	MKO	MAC	MEN	MFA	MTE	MCA	MFR	MBA	NFE	MOD	MCO	NOF	NNU	NCA	NLA	NMU	NIA	NSA	NCO	OKA	OKI	.Z.	
a.	OJA	OUU	OVI	OJA	OFI	OCO	OWU	OSA	OGL	OSA	OHY	OMI	OTU	PTU	PGU	PGU	PSP	PAN	PCO	PHE	PMA	PMI	POB	PRE	.a.	
b.	PPE	PSO	PFI	PCE	PED	PAR	PDI	PNO	PSC	PUR	PED	PIA	PLI	PNO	POU	PSA	PCT	PYO	PHA	PPT	PAN	PCL	PPU	PMA	.b.	
c.	PPE	PRR	PAM	PCR	PAQ	PAR	PDI	PCO	PST	PAC	PAT	PCO	PLU	PVU	PPR	PDA	PTE	PAU	PAC	PEM	PSP	PIX	PPE	PAN	.c.	
d.	PAN	PED	PQU	PBE	PLO	PME	PNI	PRE	PVE	PSA	PES	PAN	PAN	PAN	PAN	PAN	PAN	PAN	PAN	PAN	PAN	PAN	PAN	PAN	.d.	
e.	PAF	PCA	PSA	PVI	PAR	PAV	PCE	PCE	PDO	PDO	PDO	PIA	PMA	PSE	PSU	PCA	PRF	PGU	PNO	PTE	PER	PSA	PSE	PSO	.e.	
f.	PLO	PHI	PCR	PCO	PPY	OSU	BSA	RSE	ROD	ROF	RPA	RH	RVE	RHI	RUI	RSA	RUI	RUI	RUI	RUI	RUI	RUI	RUI	RUI	.f.	
g.	ROC	RGR	ROF	SCH	SOF	SSC	SCA	SCA	SNI	STR	SSE	SHO	SMA	SLO	SMA	SSC	SOL	SCA	SCE	SED	SAN	SAL	SIN	SRA	.g.	
h.	SBI	SEX	SIT	SSP	SOD	SSC	SAL	SAR	SAE	SAV	SFE	SGI	SHY	SIN	SIN	SIN	SIN	SIN	SIN	SIN	SIN	SIN	SIN	SIN	.h.	
i.	SRO	SAV	SAL	SBI	SSU	SJU	SST	SAC	SOL	SCY	SNO	SFU	STU	SAI	SCR	SVR	SSE	SSE	SSE	SSE	SSE	SSE	SSE	SSE	.i.	
j.	SMA	SNU	SAD	SER	SGU	SHU	SBE	STO	SGO	SPE	SNU	SCU	SJA	SMA	SIN	TUV	TUO	TOK	TOK	TOK	TOK	TOK	TOK	TOK	.j.	
k.	TVO	TCA	TTE	TPI	TDA	TCA	TGR	TSE	TUO	TAM	TPO	TBI	TNA	TAF	TAN	TCU	TAL	TAN	TFR	THI	THY	TIN	TNI	TPR	.k.	
l.	TRE	TRE	TUO	TVE	TWI	TAF	TFO	TIR	XIR	TAE	TCA	TGO	TDI	TDU	TMO	TPO	TSP	TTI	TTU	TGO	TRH	TGO	TRH	TGO	.l.	
m.	TFA	UTU	UGA	ULO	UDI	VAN	VAS	VCO	VHA	VVI	VLO	VVA	VZI	VAN	VBE	VDA	VER	VFA	VER	VFA	VER	VFA	VER	VFA	.m.	
n.	WFI	VAC	VAN	VNU	VRA	VUM	VUN	VUN	VUN	VSE	VLA	VVO	VSI	VSI	VSI	VSI	VSI	VSI	VSI	VSI	VSI	VSI	VSI	VSI	.n.	
ALTERNATIVE CROP MATRICES																										
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25		

Table 15. Antitumor Agents

A.	AFS	AMO	ATH	ATA	AME	ANI	APY	ASE	ASA	ANA	ACA	AMA	ACH	ADI	AVA	AME	ASC	ATO	ALE	ASI	ACR	ADA	A.		
B.	ADE	AEL	AIN	ARE	ARI	ASI	ASN	ASP	A'R	ACA	AGI	AST	ATE	AFO	AMO	APV	AM	ACE	ACH	AFI	ASA	ASC	ATU	AMU.B.	
C.	ABA	AFE	APF	APR	APU	AVU	ABU	AGR	AHY	ALI	ATR	ABR	AOC	AGE	AHA	AGR	AAR	ACH	ADI	AMO	C.				
D.	AMU	ARE	ASQ	APU	ACE	AVU	ABU	AGR	AHY	ACO	ALA	ACA	API	AES	ARO	AMO	AXA	AEL	AAB	ACI	ADR	AMA	AVU.D.		
E.	AAL	ACH	AIN	ASP	ADO	AGR	ATR	ADE	AOF	ACU	ACA	AHO	ABE	ABY	ABA	AST	ABI	ACA	AAF	ACO	PMO	E.			
F.	BRA	BGA	BFR	BAE	BSP	BNI	BVU	BEE	BAL	BES	BSY	BHI	BEK	BOF	BOR	BSA	BNI	BCE	BOF	BFL	BGA	BGA	BIN	BIN.F.	
G.	BIS	BPE	BSA	BGU	BER	BGR	BBR	BDE	BBU	BRA	BGA	BCH	BJU	BNA	BNA	BOL	BOL	BOL	BOL	BOL	BOL	BPE	BRA.G.		
H.	BHU	BGA	BIN	BMA	BUN	BAL	BUT	BLA	BDA	BPA	CCO	CES	CSA	CCP	CCA	CCO	CCU	CPA	CSI	CRD	CIN	H.			
I.	CEN	CGL	CPL	CED	CSA	CSP	CAN	CBA	CCB	CER	CPU	CPA	CCD	CGR	CTI	CIL	CSP	CAM	CUR	CED	CAL	CAU	I.		
J.	CCE	CSE	CGR	CDE	OMO	GPU	CSA	CEL	CUL	CED	CRO	CPE	CCI	CIP	CSI	CSE	CAL	CBU	CAL	COM	CVI	CEX	CTI	J.	
K.	CCI	CCO	CCO	CMA	CSP	CCA	CDE	CAN	CEN	CIN	COF	CBU	CCA	CCA	CVE	CCO	CLA	CAU	CGR	CLI	CME	CPA	CNE.K.		
L.	CSI	C'A	CFI	CFO	CDJ	CIA	CAE	CUE	CNU	CAR	CBE	CCA	CCO	CLI	CLA	CAC	CNI	CVE	CAU	CAM	CPA	CES	COF	CA.L.	
M.	COL	CTE	CSA	CVA	COL	CAV	CGH	CCO	CCO	CCE	CHE	CTI	CAB	CMA	CSA	CBR	CJU	CIA	CFA	CSP	CTI	CAN	CME	CSA.M.	
N.	CTI	CMA	CHI	CMO	CPE	CCY	CLO	CZE	CPE	COB	CCI	CTI	CAB	CMA	CMY	CIA	CSC	DCA	CPL	CTR	CES	CRO	CSE	DFR.N.	
O.	DEL	DAE	DCA	DSP	DEL	DMA	DIN	DAN	DAR	DRE	DAL	DOR	DFU	DDE	DEX	DIB	DAL	DBU	DCO	DCO	DFL	DMA	DOP	DCU	O.
P.	DEB	DKA	DVI	DOD	DOF	DUN	DHE	DMA	DNI	DZI	DCO	EEL	EGR	ECP	EPA	EPH	EDU	ECO	EIN	ECA	ECI	ECO	P.		
Q.	EGL	EUJ	EGE	ESI	EAR	ECH	ECU	ELE	ETE	ETP	EOP	EGL	EJA	EFO	EVE	EFO	ESP	EUT	EUN	EAN	ELO	FES	FTA	FGR.Q.	
R.	FSY	FSE	LI	FAR	FID	FLO	FOW	FPR	FPU	FTI	FCA	FEL	FVO	FGL	FIN	FVU	FSP	FAN	FCH	FVE	FVI	FAP	FEL	FTO.R.	
S.	GNU	GLA	GLI	GMA	GMU	GTI	GPR	GSA	GTI	GLU	GUR	GIA	GMA	GGL	GLE	GAN	GAB	GAB	GHI	GAS	GAB	GTI	HCO	HAN.S.	
T.	HNU	HTU	HZE	HAL	HBE	HBR	HGA	HSE	HJA	HNU	HBU	HDI	HVU	HCO	HILU	HAN	HNI	HRI	HSP	HOE	IAM	IPA	IWE	T.	
U.	IAR	IHI	TSP	ITI	TED	THE	IAQ	IBA	IER	JOF	JCH	JAI	JCI	JNI	JRE	JNA	JCO	KGE	KSC	LPU	LSA	LVI	LSI	U.	
V.	LIT	LHE	LKI	LOW	LGA	LDO	LHI	LSA	LNO	LIA	LSP	LST	LIN	LMI	LOL	LSA	LVI	LIA	LCU	LST	LFE	LGO	LLF.V.		
W.	LOF	LRI	LAL	LBA	LDO	LUS	LMI	LCH	LIN	LMU	LPE	LNI	LUR	LUT	LCO	LPE	LTE	LAC	LCY	LAL	LCH	LES	LPI.W.		
X.	MSP	MLO	MHO	MUN	MPU	MBA	MSY	MAM	MOF	MIN	MDI	MES	MGL	MRI	MZA	MAR	MVU	MCH	MVI	MAR	MFA	MLU	MOR	MPO	NSA.X.
Y.	ISC	MCA	MUS	MBI	MAL	MIN	MOF	MSU	MMI	MOR	MAR	MGE	MPI	MPU	MRO	MSP	MCH	MMI	MBA	MCH	MDE	NPE	MCI	MOL	MAL.Y.
Z.	MNI	MRU	MDE	MKO	MAC	MEN	MFA	MTE	MCA	MFR	MBA	MPE	MOD	MCO	NOF	NNU	NCA	NLA	NNU	NKA	NSA	NCO	OMA	OKI	OSA.Z.
a.	OJA	OSU	OVI	OJA	OFI	OCO	OVU	OSA	OGL	OSA	OHY	OMI	OTU	PTU	PTU	PGU	PSF	PAN	PCO	PHE	PMA	PMI	POB	PRE	PVI.a.
b.	PRR	PSO	PFI	PCE	PEB	PAR	PDI	PCS	PUR	PED	PLA	PLI	PMO	POU	PSA	PCU	PAU	PHA	PPT	PAM	PCL	PPU	PMA	PIB.b.	
c.	PFA	PRR	PAM	PCE	PAQ	PAR	PCA	PCO	PST	PAC	PAT	PCO	PLU	PUU	PPR	PDA	PTE	PAU	PAC	PEM	PSP	PLX	PPE	PAM	PDI.c.
d.	PRA	PAN	PED	PBU	PBE	PIU	PNE	PVE	PFA	PES	PAM	PAN	PAN	PBU	PPE	PPE	PSE	PTU	PFA	PTU	PRU	PTU	POL	d.	
e.	PAF	PCA	PSA	PVI	FAR	PAV	PCE	PCE	PDO	PDO	FDU	PLA	PMA	PPE	PSA	PCU	PPR	PGU	PMO	PIE	PKR	PSA	PSO	e.	
f.	PLO	PPH	PCR	PCO	PPY	QSU	RSA	RSE	ROD	ROF	RFA	RHR	RVE	RHI	RNI	RRU	RSU	RAR	RCQ	ROF	RSP	RSP	RID	ROC.f.	
g.	ROC	RGR	SOJ	SGH	SOF	SSC	SCA	SMI	STR	SSE	SHO	SMO	SLO	SMA	SLO	SCE	SOL	SCA	SCE	SED	SAN	SAL	SIN	SFA.g.	
h.	SBI	SEX	SIT	SEP	SOD	SGL	SCH	SAL	SAR	SAE	SAV	SFE	SHY	SIN	SIN	SGH	SLA	SMA	SME	SMU	SNI	SOU	STO	STU.h.	
i.	SRO	SAT	SAL	SBI	SHA	SSU	SJU	SST	SAC	SOL	SCY	SMO	SFU	STU	SAL	SCR	SWR	SSI	SSE	SRE	SCO	STE	SVI	SGR	SHI.i.
j.	SKO	SSA	SNU	SAD	SER	SGU	SBE	STO	SCO	SPE	SBU	SAR	SGU	SJA	SNA	SSA	TIN	TUO	TKO	TOF	TTC	TPE	TCA	J.	
k.	TWO	TCA	TTE	TPU	TDA	TBI	TCA	TGR	TSE	TIVU	TAM	TPO	TBI	TNA	TAF	TAN	TCT	TAM	TAT	THI	THY	TNI	TNI	TPR.k.	
l.	TRE	TRE	TSU	TVA	TVE	TVI	TSP	TEO	TRR	XTR	TAE	TCA	TGO	TTI	TDU	TMO	TPO	TSP	TTI	TTU	TGO	TRH	TTO	TTU.l.	
m.	TFA	UTU	UGA	ULO	UDI	VAN	VAS	VCO	VVA	VVI	VLO	VMA	VCA	VAN	VZI	VAN	VRE	VDA	VER	VFA	VPA	VPA	VSA	m.	
n.	VFI	VAC	VAN	VNU	VRA	VUM	VUN	VUN	VNE	VLA	VRO	VVI	VNU	YSA	YEL	ZMA	ZMA	ZOF	ZAQ	ZJU	ZMA	ZJA	ZMA	n.	
1.	2	3	4	5	6	7	8	9	10	ALTERNATIVE	CRP	MATRY	17	18	19	20	21	22	23	24	25				

Table 16. Vermifuges

A.	A.	AES	AM0	ATH	AFA	AMEI	ANI	APY	ASE	ASA	ANA	AGA	ANA	ACH	ADI	AVA	ACY	AMA	ANE	ASC	AT0	ALE	ASI	ACR	ADA	A.
B.	BADE	AFE	ARE	ARI	AS0	ASV	AS0	ASP	A'R	ACA	ACR	ANY	ALI	ATR	AT0	AM0	AC0	AM0	ACE	ACH	ATI	ASA	ASC	AT0	ANA	B.
C.	G.ABA	APE	ATP	ARE	AVA	ACA	ACR	ANY	ALI	ATR	AT0	AM0	AC0	AM0	ACE	ACH	ATI	ASA	ASC	AT0	ANA	ASC	AT0	ANA	C.	
D.	AM0	ACH	AN0	ASP	ACE	AVU	ABU	AGR	AGR	ANY	AL0	ACA	ACA	API	AES	ARU	AM0	AXA	AEL	AAB	ACT	ADR	AMA	AVU	D.	
E.	AM0	ACH	AN0	ASP	ACE	AVU	ABU	AGR	AGR	ANY	AL0	ACA	ACA	API	AES	ARU	AM0	AXA	AEL	AAB	ACT	ADR	AMA	AVU	E.	
F.	F.	BRA	BRA	BGA	BFR	BAL	BSP	BNI	BVU	BEE	BAL	BES	BSY	BH1	BEX	EVU	BOR	BSA	BNI	BCE	BOF	BEL	BGA	BIN	F.	
G.	G.	BIS	BPE	BSA	BC0	BER	BUR	BER	BEM	BMU	BRA	BGA	BCH	BJU	BNA	BNI	BOL	BOL	BOL	BOL	BOL	BOL	BOL	BPE	G.	
H.	H.	HBU	CHA	BIN	BUN	BAL	BUT	BLA	BDA	BSA	BPA	CCA	CC0	CSA	CSP	CA0	CRO	CA0	COF	COF	CPA	CS1	CSA	COD	H.	
I.	I.	CEN	CGL	CPL	CED	CSA	CSP	CAN	CBA	CB0	CER	CPU	CFA	CPU	CCA	CED	CGR	CTI	CCA	CH1	CSP	CAN	CUR	CED	I.	
J.	J.	CCC	CCR	CDE	CNU	CPU	CSA	CEL	CUL	CEN	CRO	CPE	CCI	CIP	CES	CSE	CAL	CBU	CAI	CAM	COU	CA0	CVI	CED	J.	
K.	K.	CC1	CC0	CC0	CCP	CCA	CDE	CA	CEN	CIN	CRO	CBU	CCA	CCA	CTA	CVE	CC0	CLA	CAU	CAU	CGR	CLI	CME	CPA	K.	
L.	L.	CS1	CFA	CFO	CC1	CLA	CLA	CTE	CNU	CAR	CBE	CCA	CC0	CLI	CLA	CAC	CCN	CVE	CAU	CAU	CAU	CAU	CAU	CAU	L.	
M.	M.	COL	CTE	CCA	CC0	CAV	CC0	CC0	CC0	CCE	CAE	CMA	CTI	CAB	CMA	CSA	CBC	CJU	CLA	CPA	CSP	CTI	CAN	CAU	M.	
N.	N.	CFTI	CMA	CMI	CNO	CPE	CY0	CLO	CZE	CPE	COB	CCI	CFL	CNA	CNA	CH1	CCA	CSC	CDA	CPL	CTR	CSE	CR0	CBE	N.	
O.	O.	DGE	DNE	DCA	DSP	DEL	DMA	DIN	DAN	DAR	DDE	DAL	DGR	DPU	DDE	DEX	DIE	DAL	DBU	DC0	DC0	DMA	DPO	DCU	O.	
P.	P.	DEB	DKA	DVI	DO0	DUN	DHA	DNI	DZ1	CO0	EEL	ECR	ECP	EY0	EY0	EY0	EY0	EY0	EY0	EY0	EY0	EY0	EY0	EY0	P.	
Q.	Q.	EGL	F3U	E3E	EAR	ECH	ECU	ELE	ETE	ET0	EJ0	EJA	EFO	EVE	EVE	EVE	EVE	EVE	EVE	EVE	EVE	EVE	EVE	EVE	Q.	
R.	R.	F3Y	F3E	F3I	EAR	FLO	F30	FPR	F3U	F3U	F3U	F3U	F3U	F3U	F3U	F3U	F3U	F3U	F3U	F3U	F3U	F3U	F3U	F3U	R.	
S.	S.	GDU	G1A	GMA	GMU	GTI	GLU	GUR	GMA	GMA	GGL	GLE	GAN	GAR	GHA	GHE	GHI	GAR	GAB	GHA	GHE	GHI	HSP	GAB	S.	
T.	T.	HAN	H7U	H2E	HAI	HBE	HBR	CHA	HSA	HBE	HAI	HBU	HBU	HBU	HBU	HBU	HBU	HBU	HBU	HBU	HBU	HBU	HBU	HBU	T.	
U.	U.	IAR	THI	ISF	ITI	IED	THE	IAQ	IBA	IBR	JO0	JCH	JAI	JCI	JHI	JNI	JBE	JMA	JCO	KGA	KGE	KSC	LPU	LSA	U.	
V.	V.	LOF	LAI	LOW	LGA	LDO	LHI	LNA	LNO	LJA	LSP	LST	LIN	LMI	LOL	LCE	LSA	LVI	LTA	LCU	LSE	LFE	LGO	LLF	V.	
W.	W.	LOF	LAI	LAW	LDO	LHI	LCH	LIN	LNO	LJA	LSP	LST	LIN	LMI	LOL	LCE	LSA	LVI	LTA	LCU	LSE	LFE	LGO	LLF	W.	
X.	X.	MSP	MCA	MUS	MNI	MAL	MNI	MNI	MNI	MNI	MNI	MNI	MNI	MNI	MNI	MNI	MNI	MNI	MNI	MNI	MNI	MNI	MNI	MNI	X.	
Y.	Y.	ASC	MCA	MUS	MNI	MAL	MNI	MNI	MNI	MNI	MNI	MNI	MNI	MNI	MNI	MNI	MNI	MNI	MNI	MNI	MNI	MNI	MNI	MNI	Y.	
Z.	Z.	MNI	MNU	MDE	MKO	MAC	MEN	MFA	MTE	MCA	MFR	MBA	MPE	MOD	MCO	NOF	NNU	NCA	NLA	NNU	NTA	NKA	NCO	OKI	Z.	
a.	a.	OJA	OSU	OFI	OJA	OFI	OCO	OFU	OFU	OFU	OHY	OMI	OTU	PER	PTU	PGU	PSP	PAN	PCO	PHE	PMA	PML	PO0	PRE	a.	
b.	b.	PSR	PS0	PFI	CE0	PA0	PFI	PNO	PSC	PUR	PED	PLA	PLI	PHO	PTU	PGU	PSP	PAN	PCO	PHE	PMA	PML	PO0	PRE	b.	
c.	c.	PPE	PPR	PA0	PA0	PA0	PA0	PA0	PSC	PAT	PSC	PAT	PCO	PLU	PPU	PPR	PBU	PEE	PAU	PAC	PEN	PSP	PIX	PPE	c.	
d.	d.	PPR	PAN	PED	PA0	PA0	PA0	PNE	PRI	PVE	PSA	PSA	PES	PAN	PAU	PAU	PBU	PFE	PER	PSE	PTR	PSC	PIX	PPU	d.	
e.	e.	PAF	PCA	PEA	PVI	PAV	PAV	PCE	PCE	PDO	PDO	PDU	PLA	PMA	PPE	PSA	PSU	PCA	PPR	PGU	PGU	PNO	PTE	PRR	e.	
f.	f.	PLO	PPH	PPR	PC0	PPY	QSU	RSA	RSE	RNO	RPA	RKH	RVE	RHI	RNI	RKU	RSA	RVO	RCO	RCH	RSP	RSP	RSD	ROC	f.	
g.	g.	ROC	ROF	SOH	SOE	SCA	SNI	STR	SE0	SMO	SBA	SLO	SOC	SOA	SCE	SED	SAN	SAL	SIN	SRA	SED	SAN	SIN	SRA	g.	
h.	h.	SBI	SEX	SIT	SG0	SGL	SGH	SST	SAR	SAR	SAR	SFE	SQI	SHY	SIN	SCR	SIL	SIA	SNA	SME	SNI	SQU	STO	STU	h.	
i.	i.	SRO	SAR	SAL	SBI	SHA	SSU	SJU	SST	SAR	SOY	SMO	SPU	STU	SAL	SCR	SHR	SSI	SEE	SRE	SCO	STE	SYI	SGR	i.	
j.	j.	SKO	SSA	SNU	SAD	SER	SGU	SHU	SBE	STO	SCO	SPE	SOU	SAR	SCU	SJA	SNA	SSA	TIN	TUV	TKU	TKO	TOF	TCC	j.	
k.	k.	ITV	TDI	ITE	TPU	TDA	TBI	TCA	TGR	TSE	TVO	TAN	TCO	TBI	TNA	TAT	TAN	TCU	TAL	TAM	TAT	THI	THY	TIN	TPU	k.
l.	l.	TRE	TSE	TVA	TVE	TMI	TSP	TFO	TXR	TAE	TCA	TDI	TDU	THO	TPO	TSP	TTI	TTU	THO	TSP	TTI	TTU	THO	TRH	TO0	l.
m.	m.	TVA	UGA	ULO	UDI	VAN	VAS	VCO	VNI	VVE	VLA	VPL	VGA	VNI	VSI	VAN	VAR	VBE	VZA	VNE	VZA	VNO	VFA	VMA	U.	
n.	n.	WFI	VAC	VUN	VRA	VUN	VUN	VUN	VUN	VVE	VSE	VLA	VPO	VVI	VSU	XSA	ZAO	ZNA	ZOF	ZAO	ZNA	ZAO	ZNA	ZNA	n.	
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
ALTERNATIVE CROP MATRIX																										